Urban Forestry Management Plan

Town of Leesburg, Virginia

February 28, 2006

DAVEY RESOURCE GROUP
A Division of The Davey Tree Expert Company

Urban Forestry Management Plan

Town of Leesburg, Virginia

Adopted February 28, 2006
By Leesburg Town Council
Pursuant to Resolution Number 2006-38

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Executive Summary

Background and Purpose

Trees and forests are of vital importance to the environmental, social, and economic well-being of the Town of Leesburg. The Town's urban forest provides numerous benefits that are both tangible and intangible. However, this important municipal and natural resource is currently at risk. A recent forest canopy analysis determined that Leesburg has rapidly lost forests to development and other urban pressures, and in 2001, the Town only had 8% canopy cover; the national average for cities is 25% and the national goal is 40% overall canopy cover within municipal limits.

Given the state of Leesburg's urban forest and the goals of the recently adopted Town Plan, the Town of Leesburg and the Leesburg Tree Commission have taken the proactive step of creating a comprehensive, long-term *Urban Forestry Management Plan*. The Plan is intended to provide strategies, goals, policies, standards, and actions to protect, enhance, expand, and preserve the tree canopy for the benefit of the community. The Plan intends to help coordinate and improve the Town's tree management in an equitable, economic, and sustainable manner. Moreover, the Plan will be a valuable strategic planning tool, serve as a road map in recovering the loss of tree canopy, and become a part of the *2005 Town Plan*.

This Plan was systematically developed by a comprehensive review of existing Town ordinances, specifications and standards, and other master tree planting plans, through interviews with key Town staff and leaders, using public participation input, analyzing inventory data and field observations, and by applying national arboricultural standards and best management practices. This is a holistic, customized *Urban Forestry Management Plan* for the Town of Leesburg based on local conditions, resources, and priorities.

Vision

The *Urban Forestry Management Plan* takes its vision from the Town Plan to retain a high quality of life by focusing on actions to increase the benefits and values of trees, and to improve on the responsible management of Leesburg's urban forest. The Tree Commission, Town staff, and citizens have this vision for the future of the Town's urban forest:

Urban Forestry Management Plan Vision Statement

The Town of Leesburg will have a safe, healthy, and diverse tree canopy by promoting tree preservation and planting within the Town.

With the use of professional urban forestry leadership and staff, proper maintenance and planting techniques, more efficient management of Town resources, and public education and support, the Town's future urban forest will be viewed as an important community asset.

The urban forest will uniquely define the Town's character, and be a major factor in the continued growth and livability of Leesburg.

Major Goals

The overarching goal of Leesburg's *Urban Forestry Management Plan* is to guide the Town's efforts to recover the loss of tree canopy and enhance all tree-related benefits by recommending strategies and actions to improve the Town's urban forest management in an equitable, economic, and sustainable manner.

Through public participation, input from the Tree Commission and Town staff, a detailed analysis of urban forestry conditions, five major *Management Goal Areas* emerged as priorities for Leesburg:

1. **Tree Planting and Increased Forest Canopy Cover**

   Leesburg's canopy cover has been estimated at only 8%, and it is rapidly disappearing due to forest removal on private property and lack of new and replacement tree planting on public and private properties. Without an adequate forest canopy cover, Leesburg will not realize the many tangible and intangible benefits trees provide, and the character of the Town will suffer.

2. **Improved Tree Planting/Protection Legislation and Policies**

   The Town should review and improve ordinances, guidelines, and policies regarding tree planting and tree and forest protection, and create or enact new legislation and policies as needed. These policies will serve as an official statement by the Town regarding the importance and value of trees in the community.

3. **Expanded Education and Public Relations**

   Citizens, businesses, Town staff and leaders, and developers need continued education and marketing targeted to increase their awareness of the benefits of trees. They need to be aware of the availability of Town resources and the various ways they can become more involved in the urban forest management program and be a part of the solution.

4. **Improved Organizational Structure and Funding**

   Currently, the components of and resources for Leesburg's urban forest management program are decentralized in various departments. Critical to the program's success is adequate funding, a centralized focus and improved interdepartmental coordination and communication.

5. **Improved Urban Forest Maintenance**

   Proper and timely tree maintenance is required to maximize tree benefits, increase service life, improve aesthetics, and ensure public safety. Maintenance programs are critical to the survival, vitality, and growth of existing trees and of newly planted trees.

Major Recommendations

The *Urban Forestry Management Plan* presents recommendations in each major goal area and outlines programs and procedures for achieving success on small and large task items. The major recommendations for reaching the Town's goals include:

1. Achieve an overall tree canopy cover of 40% by a combination of creating and implementing a Town *Master Tree Planting Plan*, revising current legislation, enacting new legislation, creating incentives for private property owners to plant trees on private properties, and ensuring there is adequate funding for tree planting and maintenance.
2. Improve Town legislation by reviewing and amending, as needed, the Zoning Ordinance, Subdivision and Land Development Regulations, and Design and Construction Standards, as well as creating and adopting a defensible Public Tree Ordinance; and incorporate urban forestry goals, programs and tasks with all other Town plans.
3. Continue public and citizen urban forestry outreach efforts, and educate elected officials and Town employees on a regular basis.
4. Centralize urban forest management responsibilities, staff, equipment, funding, and resources, and seek new and reallocated funding sources to support a comprehensive urban forestry program at a minimum level of $175,000 annually.
5. Implement and expand various tree maintenance programs, and conduct a complete public tree inventory every ten years using a tree data software program to manage the data.

Implementation

The recommendations made in this Plan are intended to be considered and implemented over a period of ten years. The results of the Plan's implementation, in relation to the overarching goal and final measurable result of achieving an average of 40% canopy cover for the Town, may take 20 years or more.

Trees are long-lived organisms. Planting trees today will provide benefits for future generations of Town citizens. However, by having systematic tree planting and maintenance programs in place, and by having adequate funding, staffing, regulations, and public education resources today, the future public tree population and overall urban forest will be expanded and sustainable.

Leesburg can achieve a 40% canopy cover. Using the analysis and recommendations of the Plan, the Town's rights-of-way, parks, and other public properties can be planted to increase canopy cover. New and existing residential and commercial developments can be required and encouraged to plant more trees. Using computer modeling programs, tree planting efforts can be measured to predict the levels of canopy cover in various areas; an acre of newly planted oak trees will not have a large collective canopy now, but in 20 years the change can be dramatic.

Benefits

Leesburg's urban forests are municipal assets that appreciate over time because they are alive and growing. They provide tangible and intangible benefits to the Town and its citizens. Because of their significance to the environmental, social, and economic well-being of the Town, trees and the urban forest should be professionally managed and protected to preserve them now for all citizens and to expand them for future citizens.

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1.0 Introduction

The major issues of proper management, control, and protection of the natural environment has reached a level of profound importance for municipal governments across the country. Previously satisfied to serve the community by providing economic development, public safety, social services, and other basic municipal programs, elected officials and municipal staff are now being challenged, and even mandated by state and federal government, to take the lead in solving the problems of air pollution, water quality, stormwater control, solid waste disposal, wildlife protection, and other environmental issues.

The Town of Leesburg, like other municipalities, must now respond to a growing list of environmental concerns to protect the quality of life in Leesburg while simultaneously ensuring growth and complying with environmental regulations.

The urban forest within the Town may have once been considered only an aesthetic resource, but can now be looked to as a major component in the Town's plan to comply with environmental regulations, increase development, and maintain a high quality of life. A recent study conducted by American Forests concluded that in 2001, the Town's total urban forest provided approximately $11 million per year in air pollution removal, carbon storage, and stormwater management benefits and services.

However, this same study revealed that in the period between 1992 and 2001, the Town had lost 71% of this highly valuable, multi-functional natural resource to rapid urbanization and development. To date, the development and reduction of existing forest tracts have continued, and it is estimated that the total loss of tree canopy in Leesburg since 1992 now approaches 80%.

These statistics—both the loss of tree cover and the documented number and value of benefits trees provide Leesburg—have motivated the Town to seek an analysis of its urban forest and urban forestry management program and develop a professional management plan to protect and enhance this resource. Like many American towns, there is uncertainty in Leesburg whether or not the current governmental structure, organizational values, and municipal resources are sufficient to support the rational and effective management of the urban forest.

Therefore, the Town of Leesburg and the Tree Commission have taken the proactive step of creating an *Urban Forestry Management Plan*. This Plan intends to provide strategies, goals, policies, standards, and actions to protect, enhance, expand, and preserve the tree canopy for the benefit of the community. The Plan will help coordinate and improve the Town's tree management in an equitable, economic, and sustainable manner. Moreover, the Plan will be a valuable strategic planning tool, serve as a road map in recovering the loss of tree canopy, and become a part of the *2005 Town Plan*.

With professional guidance and assistance from Davey Resource Group, Leesburg's Tree Commission, Town staff, elected officials, and citizens worked together to develop the Plan. A summary of the objectives designed to reach the Town's goals for this plan includes:

1. Reviewing and analyzing the Town's current urban forestry data, planning policies, development regulations, construction standards, various master tree planting plans, and other useful documents and information.
2. Performing on-site surveys of public trees on streets, in parks, on airport property, and other areas as needed or directed.
3. Conducting interviews with Town personnel, elected officials, various commission members, and other key stakeholders.
4. Producing a draft version of the Plan for review and comment, and presenting it in a public forum format.
5. Completing the final version of the Plan.

The following sections of the *Urban Forestry Management Plan* present the results of the analysis, interviews, and public input throughout this project. The recommendations made in this plan are based on the conclusions of the analysis and input in combination with urban forest best management practices and current arboricultural standards.

The urban forest, as a municipal asset, is as important to Leesburg's economic and political viability as are water and sewage facilities, transportation systems, and community support services. The quality and availability of all these assets are indicators of Leesburg's ability to encourage people to live and support businesses to prosper within the Town limits.

It was stated earlier that Leesburg receives over $11 million per year in three quantifiable areas of urban forest benefits. This $11 million can actually be considered a conservative estimate. There are other functions and services urban forests provide that are quantifiable but were not accounted for in the American Forest study, such as energy conservation and increased property values. Also, intangible benefits with economic and social value are not included in this estimate, such as tourism, business development, noise reduction, light pollution reduction, health benefits, crime reduction, wildlife habitat, and aesthetics.

Beyond simply dollars and cents, Leesburg should increase and be actively engaged in urban forest management and public education for both philosophical and practical reasons. Like other towns, Leesburg is challenged to quickly dispel the persistent belief held by citizens, developers, and staff that the Town exists separate from nature rather than within it, and that the hillsides, forests, and streams are individual features rather than a connected ecosystem. This belief has had enormous consequences for how Leesburg has developed thus far, and changes in this attitude will positively affect how Leesburg plans its future, designs and builds the roads, neighborhoods, and commercial areas, addresses regulated environmental issues, and ultimately manages the urban forest.

Leesburg's *Urban Forestry Management Plan* is a starting point and guide for viewing and using the urban forest to accomplish the many goals of the *2005 Town Plan*, to secure a better future, and to maintain the charm, history, and livability that are hallmarks of Leesburg.

1.1 *Vision Statement of the* Urban Forestry Management Plan

The Town of Leesburg's *Urban Forestry Management Plan* is both a current management document and a long-term planning tool. Initially, the Plan will help coordinate and improve the Town's tree management actions in an equitable, efficient, and sustainable manner and focus on applying current arboricultural standards and practices to municipal tree care and planting efforts. In the long-term, the Plan will be a valuable strategic planning tool, serving as a road map to guide the growth and progress of the Town's comprehensive urban forest management program.

The *Urban Forestry Management Plan* is a part of and supports the *2005 Town Plan*. The Town Plan states that Leesburg's challenge and overall vision is to "accommodate its share of growth while retaining and enhancing the Town's character and quality of life." The Town Plan commits to maintaining a high quality of life by "protecting natural and heritage resources, and protecting against negative environmental impacts."

The *Urban Forestry Management Plan* takes its vision from the *2005 Town Plan* to retain a high quality of life by focusing on actions to increase the benefits and values of trees, and to improve the responsible management of Leesburg's urban forest. The Tree Commission, Town staff, and citizens have this vision for the future of the Town's urban forest:

Urban Forestry Management Plan Vision Statement

- *The Town of Leesburg will have a safe, healthy, and diverse tree canopy by promoting tree preservation and planting within the Town.*
- *With the use of professional urban forestry leadership and staff, proper maintenance and planting techniques, more efficient management of Town resources, and public education and support, the Town's future urban forest will be viewed as an important community asset.*
- *The urban forest will uniquely define the Town's character, and be a major factor in the continued growth and livability of Leesburg.*

1.2 History of Leesburg's Urban Forest

The Town of Leesburg is located in Loudoun County and is situated between the Potomac River and the Virginia Piedmont of the Blue Ridge Mountains. The areas in and around the Town offer some of the most pastoral scenery of rolling hills and rural beauty in all of Virginia. Originally known as George Town, Leesburg boasts an impressive history. It served temporarily as partial capital of the United States during the War of 1812 after Washington, D.C. was evacuated, President Monroe wrote his famous Doctrine at his home near the Town in 1823, and the Civil War Battle of Ball's Bluff was fought in 1861 along the banks of the Potomac near Leesburg.

The forests around Leesburg provided refuge for the troops during the Battle of Ball's Bluff and a source of convenient materials for shelter, fire, and supplies. The forests where significant historic events took place are quickly disappearing from Leesburg's landscape. Photograph courtesy of Harpers Weekly, 1861.

For over 250 years, people have been attracted to Leesburg and Loudoun County because of the beautiful environment of rolling, forested hills, fertile soil, and numerous streams and rivers. Although sometimes the more popular an area becomes, the more likely it is to become a victim of its own success.

As the land in Leesburg was, and is still, settled and used for agricultural and residential home sites, the forests that historically covered the area began to disappear. Fields and lawns appeared in its place, and these are not the ecosystems that are the natural history of Leesburg.

Since settlement almost 250 years ago, Leesburg's landscape was transformed from forest and streams to cleared farm fields and grazing lands for the local gentry. Photograph courtesy of National Park Service archives.

Today, Leesburg is the county seat of Loudoun County and is one of the largest incorporated municipalities in Virginia, and sits at a literal and figurative crossroads. Leesburg was founded at a crossroad in 1758 when "the Virginia Assembly designated a site at the crossroads of the two roads . . . as the location for the Loudoun County Court House," according to a Leesburg Planning Department document entitled *Old and Historic District Guidelines.*

At present, Leesburg is not only at the crossroads between mountains and lowlands, town and country, but it is also at the crossroads of preserving its past and ensuring its future. Loudoun County and Leesburg are both experiencing rapid growth at a rate almost unparalleled in the nation. While the Town expects and welcomes the growth, there are mounting concerns about how to protect the elements that gave Leesburg its character, charm, and quality of life, and how to preserve them for current and future citizens.

1.2.1 Development of Urban Forestry in Leesburg

Protecting and preserving the Town's urban, suburban, and rural trees and forests is an important concern of Town leaders and citizens. Historically, this valuable resource has been dramatically reduced and is currently threatened by development and urban growth pressures within the Town and in the surrounding County.

Leesburg has always valued its urban forest resources. For over 30 years, the Town has had an ordinance prohibiting the damage of public trees (Article I. General; Code 1963; 15-28). In 1990, Leesburg was designated a Tree City, USA by the National Arbor Day Foundation and has maintained this distinction to the present.

In 1995, the Town created the Leesburg Tree Commission (Article X. Tree Commission; Ord. No. 95-0-2, 1-24-95). In 1997, the Town created a new position and hired a professional urban forester. The Urban Forester I position and functions are organized in the Planning Department. Since then, the Urban Forester has performed required job duties and engaged in a variety of related activities, such as:

Leesburg Tree Commission Strategic Plan 1998-2023

In 1998, the Tree Commission created a Strategic Plan and developed the following vision, mission, and goals:

Vision Statement

To provide leadership to enhance, expand, and preserve the tree canopy for the benefit of the community.

Mission Statement

The Tree Commission of Leesburg is dedicated to promoting tree preservation and planting within the Town; providing a healthy, diverse tree canopy; and ensuring an aesthetic quality of life for all citizens.

Strategic Plan Goals

- *Enhance the health, longevity, and diversity of the Town's tree canopy to achieve 40 percent cover in 25 years.*
- *Provide education on the benefits of the tree canopy.*
- *Review the Town's tree related ordinances annually.*
- *Foster a positive/cooperative working relationship with local government and community leaders.*
- *Suggest legislation to the Virginia General Assembly that will strengthen tree preservation and replanting at the local level.*
- *Develop and implement a Tree Management Plan.*

- Educating the Town's elected officials, department staff, allied agencies, and citizens about proper urban forest management, maintenance techniques, and other issues.
- Reviewing, inspecting, and commenting on tree issues related to zoning and private land development.
- Participating in the Capital Improvement Program (CIP) oversight process.
- Responding to service requests from other Town departments and citizens.
- Managing various contracts related to tree planting, maintenance, and arboricultural consulting services.
- Conducting special projects, such as tree inventories, urban forest studies, and public education programs.
- Applying for and managing public and private grants.
- Participating and organizing Arbor Day celebrations and other special events.

The Tree Commission prepared a 25-year Strategic Plan in 1998 including a vision and mission statement and six strategic plan goals (as shown on page 5).

In 1998 through 2004, an inventory of public trees located on various properties, such as parks, Town-leased land, and public streets, was conducted in phases by urban forestry consultants. The inventory is not complete, and at this time has not been updated or modified to reflect tree removals, pruning, and planting work histories.

In 2004, the Tree Commission sponsored a Land Cover Change Analysis performed by American Forests. This analysis estimate that from 1992 to 2001 Leesburg experienced a 71% reduction in tree canopy, a 23% reduction of open space, and a 112% increase in urbanized areas.

Motivated by the startling results of the Land Cover Change Analysis and the state of Leesburg's urban forest in general, the Tree Commission and Urban Forester initiated the steps necessary to accomplish a major goal of the Commission's Strategic Plan—develop and implement of a Town Tree Management Plan.

The Town was successful in receiving a generous grant administered by the Virginia Department of Forestry from the U.S. Department of Agriculture Forest Service's National Urban and Community Forestry program. With supplemental contributions from the Town, funding was available to request professional urban forestry consulting services to assist the Urban Forester, Tree Commission, and Town to create the *Urban Forestry Management Plan*. It is intended that the Plan will be the guide for continued development of the urban forestry program as well as be an integral, supporting document for the *2005 Town Plan*.

The Town's next step in 2005 and beyond is to consider and implement the *Urban Forestry Management* Plan's recommendations and create Leesburg's first truly comprehensive urban forestry program. The Tree Commission and urban forestry staff should continue to promote the tangible values and intangible benefits trees provide the Town and its citizens.

1.3 Benefits and Values of the Urban Forest

1.3.1 General Benefits and Values

Collectively, the trees along streets, in parks and yards, by streams, on farms, and in other open spaces make up Leesburg's urban forest system. Whether they are native, young saplings, newly planted landscape trees, or mature shade and woodland trees, the whole forest canopy contributes to other efforts that strive to make the Town a better, safer, more beautiful place to live, work, and play.

Trees play an important role in Leesburg beyond providing people shade on a hot day, seasonal beauty, or a place for wildlife to thrive. Trees can:

- Absorb and filter air pollution
- Reduce energy consumption by shading homes and buildings
- Moderate stormwater flow and reduce flooding, prevent soil erosion, and stabilize hillsides
- Improve water quality by buffering ponds, streams, and rivers from pollutants
- Increase property values and help businesses attract customers and retain employees

During the planning process to develop the Plan, citizens and key stakeholders clearly expressed their deep appreciation for the value of trees in the Town. Primarily, the benefits of aesthetics, environmental functions, and ecological integrity were expressed the most.

1.3.2 Leesburg Tree Benefits and Values

The *2005 Town Plan* details nine distinct *Elements* that will individually and collectively help Leesburg achieve a better and balanced future. Public landscape trees and forest ecosystems support and enhance each of these *Elements* and can contribute greatly to their successful implementation.

1. **Town Plan Element: *Natural Resources***—The primary goal in this element is to encourage protection and restoration of ecologically valuable lands that protect water quality, wildlife habitat, and forest canopy by minimizing impacts of human activities. Benefits and values trees provide to the natural resource element are as follows:
   - The erosion factor on urban developed lands is greater than forests.
   - Trees can reduce the amount of sediment that runs off developed and developing land.
   - Mature trees remove air pollutants.

2. **Town Plan Element: *Parks and Recreation***—The primary goal is to have a comprehensive park system that serves the recreational needs of the community. Benefits and values trees provide to this element are as follows:
   - Trees make parks more desirable locations for recreation and leisure activities.
   - Trees and forests offer educational and interpretive opportunities for park programs.

3. **Town Plan Element: *Heritage Resources***—The Town Plan intends to protect and restore heritage resources that are significant to the Town's identity. Benefits and values trees provide to this element are as follows:
   - Individual mature trees on historic sites are markers and living witnesses of significant events and places.
   - New tree planting can complement historic sites and preservation efforts.

4. **Town Plan Element: *Community Design***—Leesburg will have an attractive and functional community design. Benefits and values trees provide to this element are as follows:
   - Trees and landscape are significant features of the Town's lasting contributions to community design, such as roads, public buildings, and parks.
   - Trees balance the built environment within the natural world.

5. ***Town Plan Element: Land* Use**—A complimentary range of land uses will be developed to encourage housing, employment, and preservation of the Town's green infrastructure. Benefits and values trees provide to this element are as follows:
   - Trees and forests efficiently and effectively separate adjacent land uses.

6. **Town Plan Element: *Housing***—The primary goal is to provide a diversity of high-quality housing for future populations and workforce. Benefits and values trees provide to this element are as follows:
   - Including street trees in landscape design increases property values.
   - Homebuyer interest and homeowner satisfaction are increased when trees are preserved and major landscape elements are already established at the time of occupancy.
   - Properly located trees reduce heating and cooling costs.

7. **Town Plan Element: *Economic Development***—Leesburg's goal is to have a strong, diverse economy that supports the Town character and high quality of life. Benefits and values trees provide to this element are as follows:
   - Development land values increase when trees are present.
   - Trees and open space increase property values, tax revenues, income levels, real estate sales turn-around rates, jobs, worker productivity, the recruitment of buyers, and the number of customers in a given area and to decrease unoccupied periods.

8. **Town Plan Element: *Transportation***—The Town intends to have a safe, convenient, and efficient motorized and non-motorized transportation system. Benefits and values trees provide to this element are as follows:
   - Trees enhance transportation routes—sidewalks, streets, and walking trails—by contributing beauty and functionality, such as shade and shelter.
   - Trees absorb, filter, and moderate air pollution from vehicles on transportation routes.
   - Trees screen roads and walkways from other adjacent land uses, creating visual and noise buffers.

9. **Town Plan Element: *Community Facilities and Services***—Leesburg will serve its citizens with facilities and services in a cost-effective, equitable, and environmentally sensitive manner. Benefits and values trees provide to this element are as follows:

   - Trees efficiently serve the community by providing energy conservation, stormwater mitigation, and pollution moderation services even after accounting for planting and future maintenance costs.
   - A comprehensive urban forestry program adhering to current industry standards and performing routine and preventive tree maintenance uses municipal funds more efficiently than a reactive energy-based management system.
   - Proactive urban forestry management programs increase public safety and decrease municipal liability for tree risk situations.

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2.0 Public Process

A crucial element of developing the *Urban Forestry Management Plan* was soliciting information from key stakeholders and citizens of Leesburg. Stakeholder input was used to assist Davey in identifying opportunities, issues, actions, and goals for the Plan. Three methods of gathering public input were used and included holding a stakeholders' public meeting, conducting interviews, and soliciting comments through a questionnaire.

2.1 Stakeholders' Public Meeting

In April, 2005, a meeting was held to inform the public of the initiative to develop the Plan and to solicit input. After a brief introduction, there were four concurrent discussions:

1. **Economic Development:** What challenges do urban forests face and what are the benefits of trees and forests to Leesburg's residential, commercial, and other economic development goals?
2. **Environmental Protection:** What are the challenges to and/or benefits of trees and forests to protect the quality of streams, hillsides, wildlife habitat, and other natural features in Leesburg?
3. **Community Livability:** How can trees enhance the character of Leesburg's urban, business, suburban, and rural areas?
4. **Organizational Structure and Funding:** How can the Town's urban forestry program be best organized to support an improved proactive program? What are the current issues regarding structure and funding?

Stakeholders' Key Comments

The comments received during the discussions were grouped into the following five main categories:

- *Tree planting*
- *Legislation and regulations*
- *Education and public relations*
- *Organizational structure and funding*
- *Tree maintenance*

These five categories were used to develop and organize the management goals section of the Plan.

A list of the comments received at the stakeholders' meeting is included in Appendix B.

2.2 Interviews

To gather more insight about the Town's current operations, issues, and goals, interviews were conducted with Tree Commissioners, Town staff, and elected officials. Interviewed positions include: Town Manager; Director of Planning, Zoning, and Development; Chief of Current Planning; Urban Forester; Assistant Director of Parks and Recreation; Director of Engineering and Public Works; Director for Economic Development; Utilities Department; and Airport Director. Interview questions are included in Appendix B. Although individual comments gathered during the personal interviews are confidential, they provided valuable information that was used to develop the Plan.

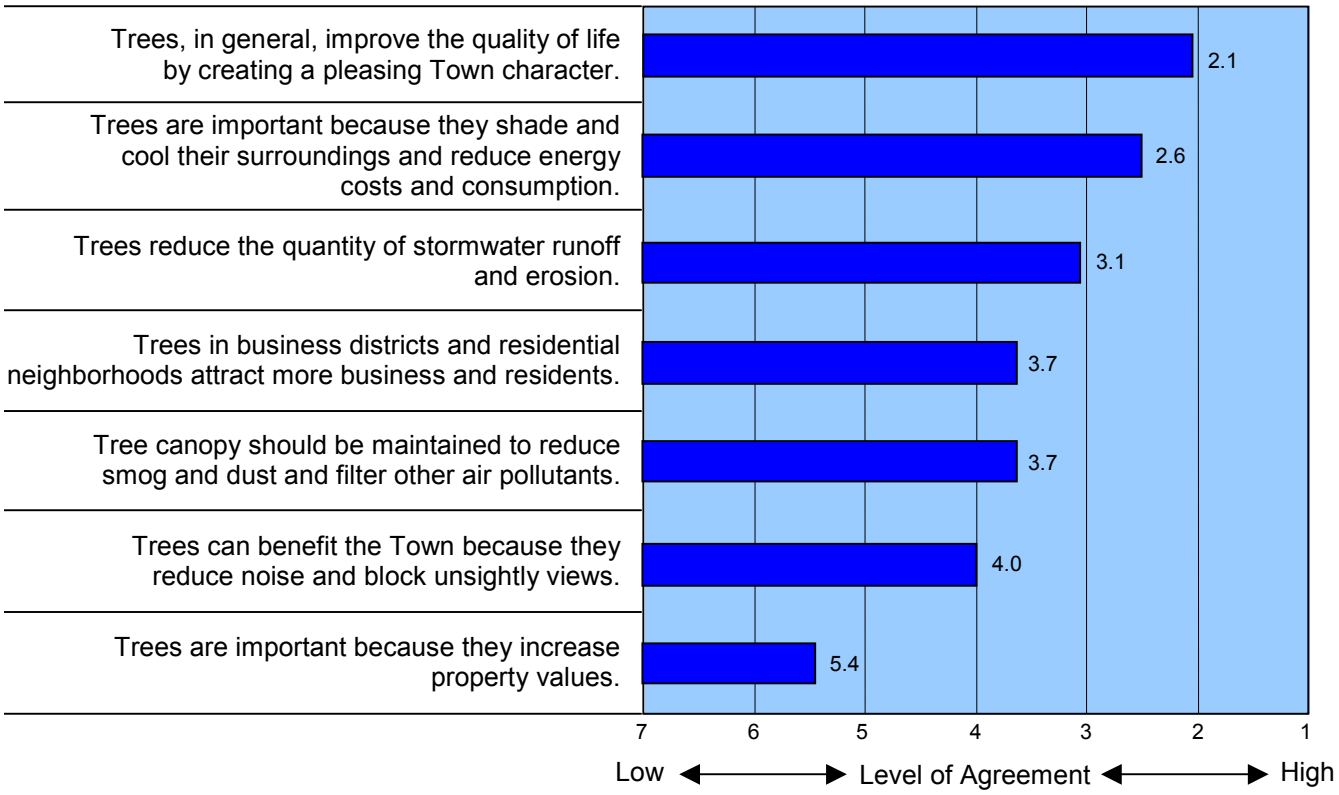
2.3 Questionnaire

Participants of the pubic meeting and all members of the Tree Commission were given questionnaires to provide additional feedback for the Plan. Individual responses to the questionnaire are confidential; however, a summary of the responses is included on the following pages.

The questionnaire (included in Appendix B) was comprised of ranking statements, rating general opinions, and replying to short answer questions. Responses to the ranking and rating portions of the questionnaire were averaged to develop the following figures.

Participants were asked to rank statements regarding the benefits of public trees based on their level of agreement with the statement (Figure 1). The average, top-ranked statement was that trees improve the quality of life by creating a pleasing Town character. Of the seven statements, the benefit that was ranked the lowest was that trees are important because they increase property values.

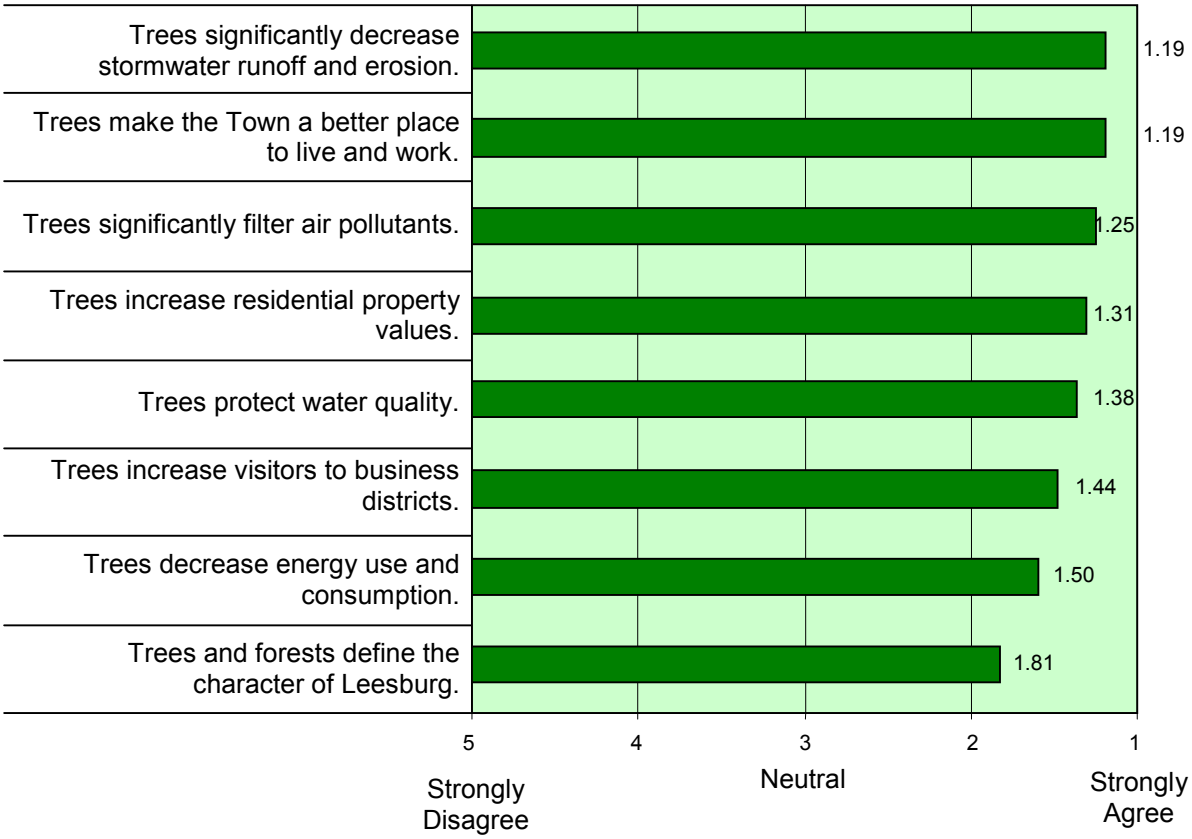
Figure 1. Benefits of Public Trees



The next series of questions asked participants to rate their level of agreement based on individual statements. Statements were rated on a scale of 1 (strongly agree) to 5 (strongly disagree). The responses were averaged and are shown in Figures 2 through 4 below.

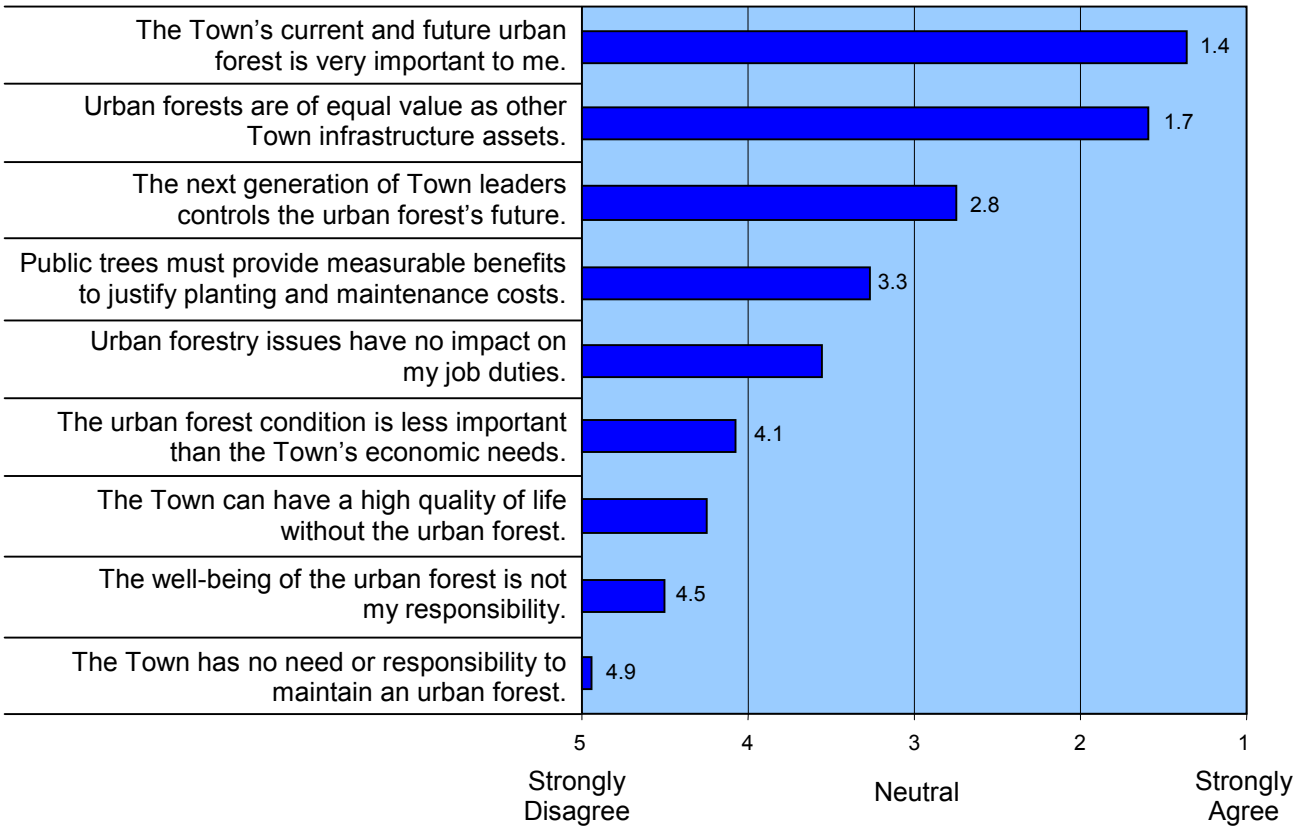
The first series of statements were related to the benefits of trees. Most all respondents strongly agreed that trees provide several significant benefits (Figure 2).

Figure 2. Tree Benefits



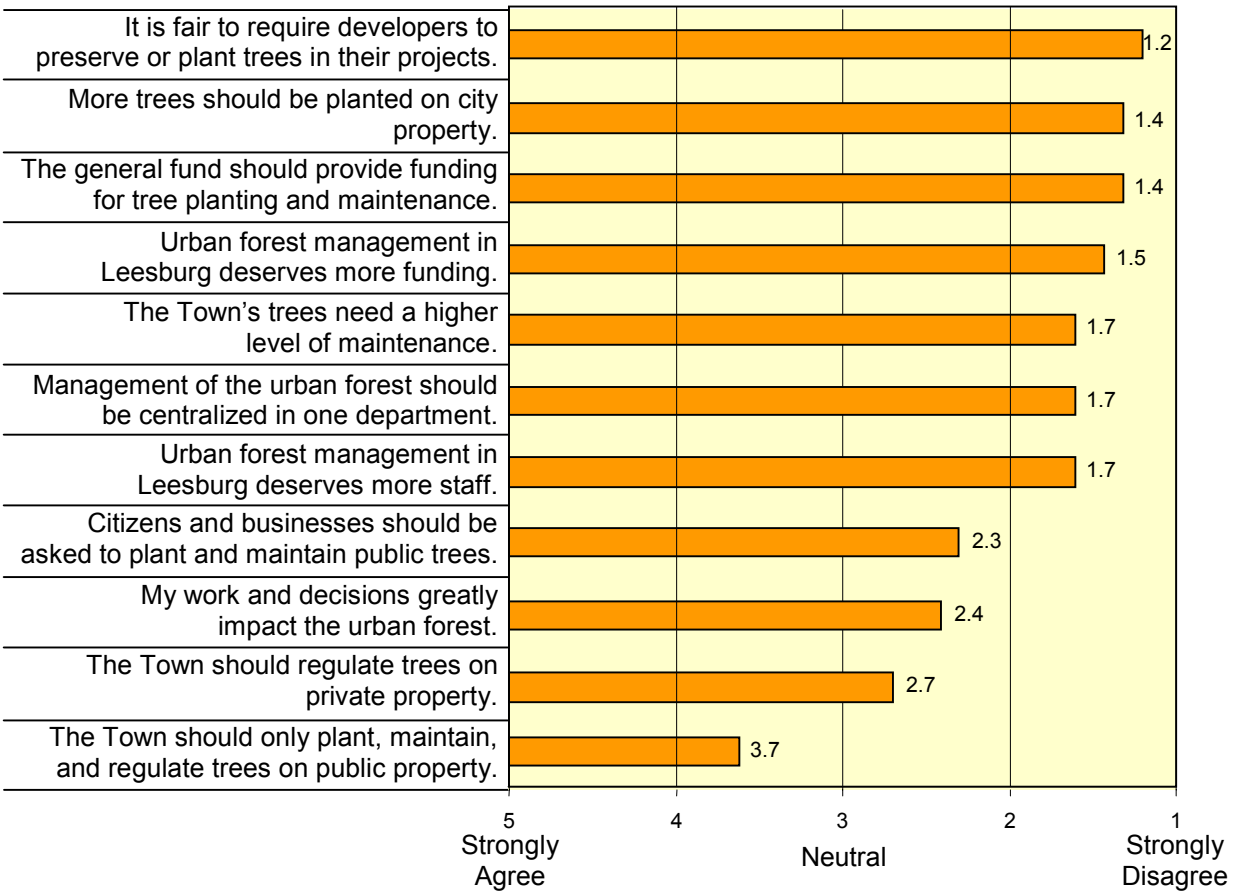
The next series of statements included a wide variety of urban forestry values, including positive and negative value positions (Figure 3). The responses to these statements indicate that respondents generally felt that the urban forest is an important asset to Leesburg, and that the Town and individuals need to take immediate responsibility to maintain it.

Figure 3. Urban Forestry Values



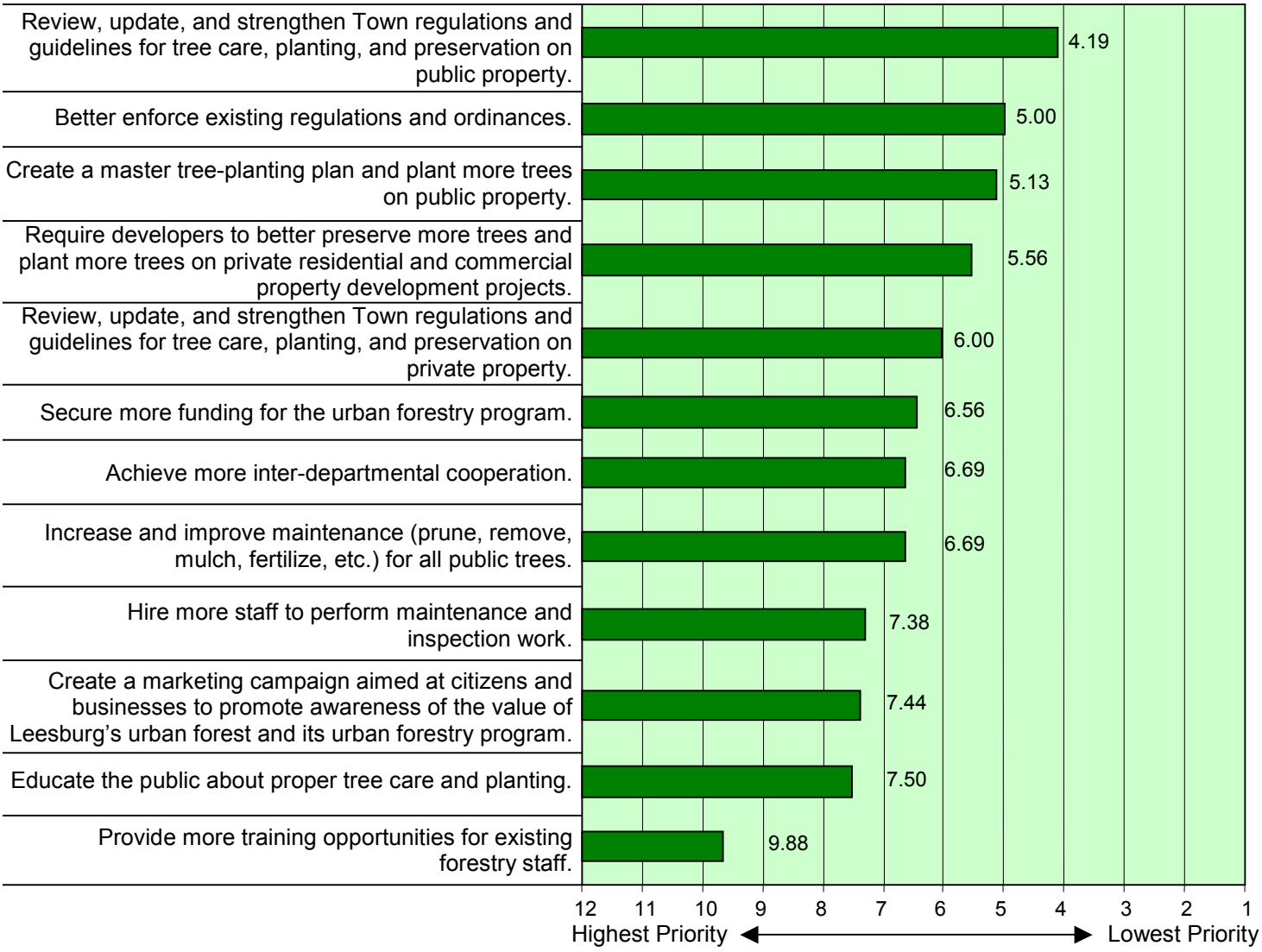
The final set of rated opinions included statements dealing with current urban forest management techniques and tools in Leesburg (Figure 4).

Figure 4. Urban Forest Management



In the last part of the Questionnaire, respondents were asked to prioritize a series of 12 actions. The average highest action priorities indicated a need for stronger regulations to preserve trees on public property and better enforcement of existing regulations and ordinances. The lowest average ranking statements relate to the need for increased training opportunities for Town staff and public education of tree care and planting.

Figure 5. Average Rank of Action Priorities



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3.0 Review Existing Plans and Regulations

An important preliminary task accomplished during development of the *Urban Forestry Management Plan* was the review of existing plans, regulations, and other documents that affect or are used in the management of Leesburg's urban forest. The following sections summarize the findings of the review of each plan and regulation, make appropriate recommendations, and suggest action steps for each document.

3.1 Plans

3.1.1 2005 Town Plan

As Leesburg's *Urban Forestry Management Plan* was developed, the Town was also in the process of reviewing, updating, and adopting the *2005 Town Plan*. The *2005 Town Plan* was adopted September 13, 2005.

Three elements are directly related to preserving, enhancing, and increasing the Town's urban forest—Natural Resources, Land Use, and Community Facilities and Services. Specific actions are identified for the Natural Resources and Community Facilities and Services elements that involve the Tree Commission.

Town Plan Element: Natural Resources Goals

- *Leesburg will identify and encourage protection and restoration of a natural open space system which will include a network of ecologically valuable lands that will protect water quality, conserve and increase forest canopy, and provide passive recreation opportunities and habitat for the flora and fauna indigenous to this area.*
- *Leesburg will minimize the adverse environmental impacts of human activities.*

Town Plan Element: Community Facilities and Services Goal

- *Leesburg will be served by community facilities and services in a cost-effective, equitable, and environmentally sensitive manner.*

Three tasks listed in the Action Program of the *2005 Town Plan* for which the Tree Commission is identified as implementing agency include:

1. Developing and adopting readily measurable standards to assess progress toward meeting the objectives of the Natural Resources element of the *2005 Town Plan* (Natural Resources Action Program).
2. Developing guidelines for reestablishing the forest canopy within the open space of developing properties (Natural Resources Action Program).
3. Developing a funded program for planting and maintaining street trees (Community Facilities and Services Action Program).

Recommendations

1. *The 2005 Town Plan should adopt Leesburg's Urban Forestry Management Plan by reference with the addition of objectives in the Natural Resources, Community Design, and Community Facilities and Services elements.*
2. *The Tree Commission should assist the Town with implementation of urban forestry related tasks in the Action Program in the 2005 Town Plan.*
3. *To continue meeting the goals of the 2005 Town Plan, the Tree Commission should develop and implement additional tasks as existing tasks in the Action Program are accomplished.*

3.1.2 Business Development Strategy Plan

Leesburg completed a study and adopted a strategic plan for economic development and sustainability in 2003.

Primary Objectives of

"A Business Development Strategy for Leesburg, Virginia"

- *Recommend ways for Leesburg to enhance its standing as a place to do business for both the local population and visitors.*
- *Suggest physical improvements to the community that can take place over time.*

The urban forest can and does have a great impact on the long-term economic viability of Leesburg. Many conclusions and recommendations in the *Business Development Strategy Plan* propose to directly increase the tree canopy in the Town and provide better management of the urban forest to support businesses in Leesburg, for example:

- Well-planned tree planting in retail districts would improve the visual and physical experience of being in Leesburg by providing unity, screening undesirable views, and providing shade and beauty for customers.
- Trees and landscaping would be a primary element for creating a hierarchy of gateway treatments that will define and designate distinct areas of Leesburg for visitors.
- Unique business opportunities exist because of their proximity to parks, forest areas, and the greenway of the W&OD Trail. In fact, greenway systems and tree-lined trails reinforce many of the strategies in the Business Development Plan.
- Tree-lined streetscapes, especially those planted with large canopy trees where possible, are currently lacking in Leesburg, but are needed to celebrate and preserve the character of the Town.

Tax Incriment District (TID)

A TID uses property and/or sales tax revenues in a designated area to enable private development to occur.

Recommendations

The Tree Commission, Town staff, and citizens should:

1. *Support the business community's effort to create Tax Increment Districts (TID) in Leesburg. Since State Code allows this funding mechanism, portions of the TID monies could be budgeted for new tree planting, funding for design and construction of modern planting sites (*e.g.*, expanded tree pits, use of structural soil, and well-planned lighting and irrigation systems), and for routine maintenance.*
2. *Support the business community's efforts to create a grant program for tree and landscape planting on private property.*
3. *Support the Economic Development Commission's goal to create a 501(c)(3) nonprofit development organization to hold land and take donations. Critical or unique forested land or land that can be reforested that would enhance business areas, the Town, and the urban forest could be protected by this organization.*

3.1.3 Tree Commission Strategic Plan

The Town's concern for and level of dedication to urban forestry is exemplified by the existence of the Tree Commission. This citizen-based group appointed by the Town Council advises the Town on all matters related to trees and the management of the urban forest.

The Tree Commission defined its vision and mission in its 1998 *Tree Commission Strategic Plan*. Their objectives on the strategic plan are clear and far-sighted:

- Enhance the health, longevity, and diversity of the Town's tree canopy by achieving 40% forest cover within 25 years.
- Provide education and encourage community involvement in understanding the benefits of trees.
- Review the Town's tree related ordinances and development practices, and recommend positive amendments.
- Foster a positive working relationship between local governments and community leaders.
- Suggest that the Virginia General Assembly strengthen tree preservation and tree planting legislation at the local level.
- Develop and implement a Town Tree Management Plan.

The *Tree Commission Strategic Plan* is straightforward and comprehensive, and contains appropriate goals and activities for this political body. As an advisory commission, the Tree Commission appears to be fulfilling its mission and doing what is expected of them given their current role, responsibilities, and resources in the Town's overall urban forest management program.

Recommendations

1. *The Commission members, duties, and responsibilities should be formalized by including such descriptions in an ordinance of the Town Code.*
2. *Since the Commission is citizen-based, it is the key organization to seek additional funding and support from the Council and to educate and organize the citizens to support urban forest management in the Town. The Commission should prioritize their efforts to focus on these tasks.*
3. *The Tree Commission should review the* Tree Commission Strategic Plan *on an annual basis, and report accomplishments and amendments to the Town Council and the citizens.*

3.1.4 Comprehensive 20-Year Parks, Recreation, Open Space, Trails, and Greenways Master Tree Planting Plan

In November, 2002, the Town Council accepted and adopted the *Comprehensive 20-Year Parks, Recreation, Open Space, Trails, and Greenways Master Tree Planting Plan*. This was the first time a plan of such a scope was undertaken by the Town, and it was motivated by the rapid growth and potential loss of community character so important to Leesburg.

The major components and recommendations of the Plan include establishing and connecting greenways, creating an expanded trail system, preserving open space, protecting the Potomac River and stream corridors, enhancing existing parks, creating major gateway and streetscape areas, expanding recreation opportunities, and protecting historic sites.

While no direct analysis of the Town's urban, suburban, and rural forest resources was made in the plan, it is clear that many of the objectives and implementation strategies of the Park Plan coincide directly with the *Urban Forestry Management Plan* goals. The Department of Park and Recreation supports the management of forest resources as an integral part of the provision of recreational experiences to Town residents.

New tree planting and mature tree care enhances the quality of existing and new parks, trails, historic sites, and recreation areas. The protected status of parks, open spaces, stream corridors, and conservation easements make these areas prime opportunities for creating tree banks to recover overall canopy loss. Some of the revenue generating mechanisms and suggestions could be joint efforts to benefit both parks and urban forestry program goals.

Recommendations

1. *The Town Manager should direct the Urban Forester, Tree Commission, Park staff, and Park and Recreation Commission to work directly and in concert with each other to achieve the mutual goals of their individual master plans.*
2. *Investigate the use of undeveloped park land, open space acquisitions, and other similar protected properties as the location for tree mitigation sites (refer to Chapter 6.7.8 for additional information on tree mitigation sites) to increase overall canopy cover in the Town.*

3.1.5 Residential Traffic Management Plan

In February, 2001, the Town Council adopted a *Residential Traffic Management Plan* that acknowledges the growing use and dependence on automobiles and the need to provide better planned and constructed vehicular access around and through the Town.

This Plan includes the use of trees and landscaping as a traffic-calming device. The Traffic Plan and other studies across the country confirm that the presence of a tree-lined street and a canopy cover does indeed slow traffic. The presence of trees sends direct and indirect messages that drivers should slow down. In addition to contributing to traffic management goals, the trees and landscaping enhance the character of the street and the neighborhood, which, in turn, improves the quality of life in the Town.

The Town of Leesburg allows tree planting to occur on the right-of-way (Ordinance No. 2004-0-8). This is a great opportunity to increase tree canopy cover by planting trees appropriately on the public streets in the Town. The issue of tree placement on the right-of-way is now one that should be addressed and resolved by the Town. Public safety must be balanced with maximizing new tree plantings in Leesburg.

Typically, municipalities set standards for the clear sight distances between trees and intersections of various road types, *e.g.*, residential, arterial, or collector. They also set standards for clear sight distances between trees and other right-of-way features, such as driveways, traffic signs, street signs, parking meters, and street lights.

The City of Falls Church, Virginia has the following specifics in their Zoning Ordinance (Section 38-30. (b) (9-10)):

> (9) Sight distance for landscaping adjacent to points of access. Plantings shall be selected and located so that they do not contribute to conditions that may be hazardous to public safety. Such locations include, but are not limited to, public street right-of-ways, underground and aboveground utilities.
>
> (10) When an access way intersects a public right-of-way, all landscaping within the triangular areas described below shall provide unobstructed horizontal visibility between three (3) feet and six (6) feet above pavement level. Tree trunks may be permitted in these areas provided they do not constitute a traffic hazard. The triangular areas referred to above are formed by each side of the access way and public right-of-way line, with each side being ten (10) feet in length from the point of intersection, and the third side being a line connecting the ends of the two (2) other sides.

Other cities, such as Cincinnati, Ohio, use these specifications in their tree planting, road improvement, and subdivision specifications and contract:

> Before nursery orders are finalized, Natural Resource Management Section (NRMS) staff and contractors lay out location of all planting holes with suitable marks. Marks are 2-inch-wide arrows made on curbs that extend at least 1 foot onto street pavement. Locations meet the following standards:
>
> Tree located:
>
> 1. Centered between curb and sidewalk, at least 2 feet from curb line unless designated otherwise by NRMS.
> 2. At least 10 feet from driveways, handicap ramps, and fire hydrants.
> 3. If by metered parking spaces, 4 feet in front of meter, near rear wheel space.
> 4. No closer than 5 feet behind or 10 feet in front of signs. Trees located to keep signs visible.
> 5. At least 5 feet from marked water, gas, electric, telephone, cable TV, and sanitary sewer service branches.
> 6. To keep traffic signals and street lights visible and at least 10 feet from these structures and utility poles.
> 7. In no drainage ditches and at least 10 feet from storm sewer inlets.
> 8. At least 30 feet from intersections, measured from point where curb changes direction.

Another approach to this potential conflict is to simply review each and every tree planting on a case-by-case basis to customize and accommodate unique circumstances and conditions that occur on different rights-of-way in the jurisdiction.

Recommendations

1. *Implement the recommendations of the* Residential Traffic Management Plan *and incorporate trees and landscaping in each improvement project as appropriate.*
2. *Promote the Adopt-A-Street program of the Department of Engineering and Public Works to implement tree planting and/or maintenance of trees for traffic calming in residential neighborhoods.*
3. *Develop a regulation and/or specifications for driveway, intersection, and other right-of-way components for sight distances related to tree planting placement.*

3.2 Regulations

Leesburg regulates the urban forest through a variety of legislation. Most legislation has been created and amended over time on the local level, but Virginia regulations and laws sometimes supercede and dictate Leesburg's ability to control and manage trees on public and private properties. The following is a discussion of the primary legislation and regulations affecting the urban forest in the Town.

3.2.1 Town Code—Zoning Ordinance

The current Zoning Ordinance, adopted on February 25, 2003, guides all development in the Town. The Department of Planning and Zoning is responsible for administration, review, inspection, and enforcement of its provisions. The Planning Commission, Board of Zoning Appeals, and Town Council have key roles in enhancing the equity and effectiveness of the Ordinance.

The Zoning Ordinance does recognize the value of trees and takes several measures to account for and protect them:

- Development plans must show existing tree cover and proposed landscaping in detail.
- Tree preservation measures are required, open space percentages are dictated and encouraged, and incentives are granted for protection of natural resources at a higher level than is required.
- Residential Cluster Development design is allowed, which incorporates some low-impact development principles.
- Development in floodplains is regulated, and there are exemplary Creek Valley Buffer standards in the Ordinance.

Article 12, Sections 12.1 through 12.9 of the Zoning Ordinance have the greatest direct influence over the current and future condition of the urban forest. These sections were developed specifically to promote the planting and preservation of trees and landscape plants to achieve a specified tree canopy cover in 20 years.

Section 12.3, *Twenty-Year Tree Canopy Requirement*, is a clear and concise regulation promoting the protection and enhancement of the tree canopy cover on private property. This section provides the Town with a critical and valuable tool for comprehensive urban forest management. Although the Virginia Code (15.2-961) establishes the required canopy cover percentages, they are generally below nationally accepted standards and below what may be needed and/or desired in Leesburg to retain its character. The general concept and goals, calculations, exceptions, credits, and exclusions in this Section are all innovative and feasible.

Section 12.4, *Street Tree Applicability*, is an excellent regulation to achieve compatibility of new developments and capital improvement projects with the character of existing roads and areas in the Town. The goal to focus planting medium and large crown trees is excellent, and the number, spacing, and location requirements all follow nationally accepted standards. The no net loss policy statement for street trees is an important component of this section, and, if followed, will have a positive impact on the quality of Leesburg's urban forest.

It should be noted that this section of the ordinance was most recently amended on August 10, 2004 to allow and encourage tree planting on public rights-of-way in the Town. Sections 12.4.1, *Applicability,* 12.4.4, *Location*, and 12.4.5, *Planting Standards in the Right-of-Way,* are now revised to allow appropriate tree planting on streets.

The provisions and specifications of Sections 12.5, 12.6, 12.7, parking lot landscape requirements, and Section 12.8, *Buffers and Screening,* also appear to be effective and feasible; however, as with any zoning requirement, the ultimate effectiveness is dependant upon proper enforcement.

Section 12.9, *Plant Material Specifications*, is an excellent presentation of the types of trees desired by Leesburg and their quality, size, and diversity. The references to specifications of national and state professional organization are an important feature of this section. The stated authority of the Urban Forester to ultimately have species approval will also ensure Leesburg has a diverse and healthy future urban forest.

Recommendations

1. *Article 12.2,* Administration*, should be revised to include the Urban Forester position as the primary or one of the primary review and enforcement Town officials.*
2. *The Zoning Ordinance requires a minimum of 20% canopy cover in residential areas. Although Section 12.3 cannot be changed at this time to reflect the Tree Commission's goal of 40% canopy cover in residential areas, developers should be encouraged to strive to meet the higher goal. In addition, the Tree Commission should pursue legislative changes at the state level to increase canopy cover goals.*
3. *Research and implement the long-term inspection and enforcement of the tree canopy requirements. Currently, no enforcement, penalties, or long-term compliance inspection provisions are established for the provisions in Section 12.3. If a developer initially complies with the requirement and indeed preserves or plants sufficient trees to achieve the required canopy cover, the Town appears to have no recourse if all the trees die after a period of several years and the performance bond is released. Also, private property owners are free to remove existing and newly planted trees at will once the development is complete. It is recommended that Section 12.2.4,* Monitoring and Enforcement*, be reviewed to include a requirement that the Homeowner Association or the commercial property owner be continually required to make annual or bi-annual reports to the Planning Department and/or Tree Commission about the quantity and condition of the urban forest on their private properties.*
4. *The schematics and specifications for planting trees in the right-of-way in Section 12.4.5.A and B are outdated. These should be replaced with currently approved methods for planting trees in streetscape and roadside situations.*
5. *Section 12.9,* Plant Material Specifications*, should be amended to reference specific, current, and nationally accepted professional arboricultural and horticultural standards, such as American National Standards Institute (ANSI) Z60.1, ANSI A300 (ANSI standards are included in Appendix C), and the USDA's Plants Database, and to reference updated related professional organizations, such as the American Nursery and Landscape Association. The references to state and local specifications should remain, but be reviewed regularly to ensure applicability.*
6. *Create a special purpose district for the existing tree canopy in Leesburg. The tree canopy special purpose district would be defined by the limits of the remaining forest canopy tracts in Leesburg. These data have been developed and are easily updated using Geographic Information Systems (GIS) technologies. All development plans could be analyzed in terms of the impacts on the urban forest canopy cover. Appropriate enforcement of existing tree preservation regulations and replacement tree planting could be determined before the site is disturbed. This information could be used for voluntary tree preservation actions or as guidelines to educate developers.*

3.2.2 Town Code—Article I

Key Benefits to Adopting a Public Tree Ordinance

- *Provides permanent procedures and legal authority*
- *Establishes an official policy for the Town*
- *Identifies standards and regulations for arboricultural practices, such as planting, removal, maintenance, and selection of appropriate tree species for the Town's trees.*
- *Makes the Town's tree management program more visible*
- *Establishes a program independent of changing public opinion and finances*
- *Provides a channel through which governmental departments may interact*
- *Establishes the nature and degree of public responsibilities to the Town's trees according to specific standards*
- *Provides the means to educate the public about the benefits of the urban forest (Ricard, 2002)*

Leesburg lacks a separate and distinct public tree ordinance within the Town Code. The only formal acknowledgement of public trees is found in Article I. Section 11-28 (c). This section simply states that no person shall damage a public tree.

For Leesburg to legitimately claim to have a comprehensive urban forestry program, a public tree ordinance should be in place. Generally, a public tree ordinance establishes standards and sets guidelines. It is the legal framework within which local tree management activities are conducted for the general welfare.

A public tree ordinance is not an end in itself; rather it is one of a number of important tools that must be used to attain a healthy, vigorous, and well-managed community forest. An ordinance is not a panacea for poor or inadequate management of community tree resources, but it is a valuable support mechanism for comprehensive community forest management and should not be viewed as simply another regulation.

A public tree ordinance also acts as a solid example of how the Town and citizens should manage the trees under their control. Tree ordinances can enhance the valuable natural resource of the urban forest and ensure that it is protected to provide public health and safety as well as many other important benefits.

Recommendations

1. *Create and adopt a basic Public Tree Ordinance and make it part of the Town Code (See Appendix D for an example).*

1. *Include the establishment of a Public Tree Work Permit process in the proposed Public Tree Ordinance or within the current Engineering and Public Works system.*

   The permit process would require all parties, including other government units, utility companies, developers, and citizens, to submit a permit application and receive an approved permit before any public tree is pruned, removed, or planted. There may or may not be a fee associated with the permit. If a public tree is damaged, affected, or planted without Town approval, then the Town would have the right and authority to require compensation and/or correction of the problem at no direct cost to the Town. The permit system would allow the Town better control over the actions of individual citizens and businesses, especially related to tree planting in the public rights-of-way and in the vicinity of utilities.

   The permit need not be seen as a hindrance or obstacle to doing tree work or tree planting on public trees and property, but rather more of an organized method of ensuring knowledge and communication between the Town's Urban Forester and the party applying to do the work or planting. The current permit form used by the Department of Engineering and Public Works could simply be modified to include sections or lines dedicated to tree maintenance and planting activities on the public right-of-way. The permit would have the Urban Forester inspect the site prior to planting and give guidance as to proper species, size, and final location. For tree pruning and removals, the Urban Forester would give guidance on the appropriateness of the maintenance task and ensure proper arboricultural standards were followed.

2. *Include a description of the Tree Commission and its duties in the Ordinance. The composition of the Commission, the appointing body, and general duties should be specified in a section of the ordinance.*

3. *Include a section specifically for compensatory payment for damages to public trees. If an automobile accident occurs or a public tree is illegally and improperly pruned, the Town should collect damages from the responsible party to compensate for the corrective action needed and/or loss of the public tree. The Urban Forester should be designated as the authority to determine this amount using local standards or national standards, such as the formulas developed by the Council of Tree and Landscape Appraisers.*

3.2.3 Subdivision and Land Development Regulations

The Subdivision and Land Development Regulations were most recently adopted in October, 1990. Since that time, there have been numerous amendments, and there will likely be more as this is a living document and Leesburg rightly revisits these regulations as the development climate changes, new building technologies are developed, and land and natural resource information is learned.

These regulations attempt to preserve Leesburg's tree canopy by requiring developers to submit detailed plans, construction, and development plans and documents, indicating the presence of large diameter trees and groups of forest trees, identification of tree protection and tree preservation areas, and landscaping calculations.

While many of the important components of a progressive subdivision regulation model that promotes urban forestry goals are present in Leesburg's regulations, they may lack long-term effectiveness due to three factors: (1) the Urban Forester is not recognized as an officially designated reviewer in the entire process; (2) there are no consequences or penalties for the removal of trees and forested areas; and, (3) there is a lack of tree replacement requirements based on criteria of what existed on the land prior to the disturbance and the overall canopy goals of Leesburg.

Recommendations

1. *The Town should consider restructuring Section 13.45,* Fees*, to include charges for inspection of tree preservation areas and new tree plantings (to the extent permitted under Virginia Code). These fees could be used to support a part-time or full-time public employee or a contractual consulting Certified Arborist to ensure that the review process is conducted fairly and professionally, and freeing the Urban Forester position from these duties to accomplish other urban forest management goals and tasks.*
2. *The Urban Forester should be named as a designated reviewer throughout the entire plan review process.*
3. *Section 13.86,* Landscaping and Tree Cover*, should be reviewed and amended to address the issue of tree loss during development. Regulations could require a no net tree loss policy for private property development as well as for public capital improvement projects. Currently, this section states that any forest cover lost on cut and fill slopes can be reclaimed with grass or other plants; reforestation is only an option. Tree mitigation sites could also be used to mitigate for tree loss while allowing development.*
4. *Section 13.99,* Definitions and Rules of Construction*, should add the* Urban Forestry Management Plan *to the 11 named Required Specifications, and make appropriate references to it throughout the regulation document.*

3.2.4 Design and Construction Standards Manual (DCSM)

Article 8, *Vegetation Preservation and Planting*, of the DCSM contains the standards used for regulating the removal and replacement of vegetation within the Town limits to promote the benefits of planting and preserving landscape materials, such as trees, shrubs, and other vegetation. The standards contained within the sections of Article 8 apply to private property development and public street construction.

The purpose and intent of this Article are broad and admirable. However, the details and specifications found within certain sections could be improved and expanded to truly achieve the stated and implied goals of the Article relative to protecting trees and forests. Currently, there are six pages of details for residential lawn establishment and only two pages for existing tree protection.

The science of arboriculture and the practical use of technical information about tree physiology and tree preservation measures have grown rapidly in the last decade, and the body of knowledge and experience continues to expand. Leesburg should use these resources to revise and strengthen most of the Sections in Article 8.

Recommendations

1. *Officially state that all fieldwork shall be done in accordance to American National Standard Institute (ANSI) horticultural and arboricultural standards. This first DCSM revision is recommended because ANSI Standards are the currently accepted national and industry standards, and the use of these standards will also likely have the greatest positive effect and comprehensive impact on the execution and success of tree preservation and tree planting activities in the Town (See Appendix C for current versions of applicable ANSI Standards).*
2. *Section 8-310,* Existing Trees*, will be improved by referencing ANSI A300 Part 5 standards. However, the Town should also revisit the replacement policy for retained trees that are damaged. Currently, only a 4- to 5-inch caliper tree must be planted for the loss of any size preserved tree.*
3. *Section 8-400,* Preservation of Vegetation*, will be improved as well with ANSI standard references, but it is also recommended that the Urban Forester be designated as an approval source in 8-420 (2).*
4. *Section 8-500,* Tree and Plant Selection*, should refer to the updated lists and guidelines in the Zoning Ordinance; however, currently there is a reference to Article 9A in the Zoning Ordinance that appears to be incorrect.*
5. *Section 8-600,* Field Practice*, should be expanded to include the ANSI Standards, but it is appropriate to include other national, state, and local standards here as well. The American Association of Nurserymen reference should be changed to reflect the organization's new name—American Nursery and Landscape Association. Other organizations and guidelines to reference include Tree Care Industry Association (TCIA), International Society of Arboriculture (ISA), and Society of American Foresters (SAF). The organizations, and especially their professional accreditation programs (Certified Tree Care Company, Certified Arborist, Certified Forester), offer many useful guidelines and standards for tree and forest protection.*

3.2.5 Virginia Code 10.1-1127.1 Tree Conservation Ordinance

Leesburg is hindered from enacting some legislation and taking some actions that other cities across the nation can do within their comprehensive urban forestry program because the municipalities in the Commonwealth of Virginia are subject to the Dillon Rule of local governance.

However, Virginia Code 10.1-1127.1 clearly gives the Town the right to create and adopt a public tree ordinance as previously suggested. This section of the Code directly states that the local governing body may adopt an ordinance "regulating the preservation and removal of…street trees. … Such ordinance…may include reasonable fees for the administration and enforcement of the ordinance and may provide for the appointment… of an administrator of the ordinance." The Code even states that an arborist or urban forester should be employed and it allows for penalties for violations.

Recommendations

1. *The Town attorney should review the Virginia Code and confirm Leesburg's ability to create and enact a public tree ordinance.*
2. *The Town should proceed with adopting a basic ordinance within the next year.*
3. *With the advice of the Tree Commission, the Town should suggest and prepare potential legislation to strengthen tree preservation in the Virginia Code to the local state legislative delegation.*

3.3 Other Regulations and Documents

The Town's Urban Forester currently has three documents that are used as references for developers, contractors, and other Town departments when tree planting, maintenance, and preservation efforts are undertaken:

- *Tree Removal and Replacement Guidelines*
- *Tree Planting Specifications*
- *Tree Protection Specifications*

These reference guidelines and specifications were recently updated by the Urban Forester to incorporate new or improved arboricultural procedures based on scientific research and empirical studies, and to be in accordance with other Town requirements and guidelines.

These three documents have been reviewed, and they appear to be based on sound arboricultural principles and practices and need no major changes or improvements at this time. Similar examples of each document with different language, updated references to industry standards, and other requirements are provided in Appendix E. The Urban Forester may want to incorporate parts of these examples into future revised guidelines and specifications.

Recommendations

1. *The Town Urban Forester should revise the current guidelines and specifications to incorporate references to current industry standards and to generally clarify particular practices.*
2. *The Urban Forester should review these documents on an annual basis to determine if improvements are needed to keep them current with industry practices and based on the success or failure of compliance and their implementation on projects in the Town.*

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4.0 Current Tree Management Structure

The management of the urban forest within the Town boundaries is the responsibility of many entities and individuals. If the urban forest is defined as the individual landscape trees and total forest canopy cover within Leesburg, then the primary stewards of this resource are the private property owners. Over 75% of the land in Leesburg is privately owned and controlled. Therefore, the greatest challenge, as well as the greatest opportunity for protecting and enhancing the Town's urban forest, lies with educating and working with citizens.

However, the responsibility for a significant portion of the current and future urban forest lies directly with the Town of Leesburg. Approximately 25% of the land in the Town is publicly owned, such as street rights-of-way, parks, airport property, and other municipal land holdings. Several Town government departments have direct control over and responsibilities for tree maintenance and planting. Other Town entities, such as various advisory commissions, business organizations, and volunteer groups, have indirect influences on the quality and quantity of the urban forest.

Currently, the Town's tree management structure can be described as *decentralized*. This means no single agency or staff position has direct, comprehensive, and ultimate legislative or management responsibilities for public trees. In the Town of Leesburg, many municipal agencies and entities directly and indirectly affect urban forest management, including: Department of Parks and Recreation; Department of Planning, Zoning, and Development; Department of Engineering and Public Works; Office of Capital Projects Management; Department of Utilities; Airport; Mayor and Town Council; and the Town Manager.

4.1 Town Organization and Urban Forestry Management Responsibilities

4.1.1 Department of Parks and Recreation

This department has direct control over the acquisition, development, and maintenance of over 600 acres of primarily natural, open space in the Town. The landscape trees and forests in Town parks, community parks, and neighborhood parks are planted and maintained by departmental staff and contractors.

This department also has the primary responsibility for implementing the *Leesburg Comprehensive 20-Year Parks, Recreation, Open Space, Trails, and Greenways Master Tree Planting Plan*. Within this plan are clear goals and objectives that directly affect a large portion of the public urban forest. The decisions, policies, and actions of the Parks and Recreation Commission also have an influence on public trees.

Section 11-81 (b) (1) and (2) of Article V, *Public Parks*, in the Town Code briefly acknowledges public trees in parks and regulates their protection against damage.

4.1.2 Department of Planning, Zoning, and Development

The Department of Planning, Zoning, and Development develops policies for the orderly growth and development of the Town and enforces the adopted land use and zoning regulations. The Planning and Zoning staff provides inspections on construction sites, ordinance violations, bond processing/release, and tree preservation to ensure that development conforms to Town regulations and to ensure protection of public health, safety, and general welfare. These responsibilities impact the privately owned urban forest more than the publicly owned urban forest and, therefore, can likely have the greatest and most long-term impact on the Town's total canopy cover.

The Town's Urban Forester position and the advisory Tree Commission are organized in this department. Because of the land development process responsibilities and inspection duties, the Urban Forester is primarily used and funded by the Planning Department's budget to implement and perform Planning Department duties, such as plan review, site inspections, enforcement actions, and contract management.

However, because the Urban Forester has the most arboricultural education, expertise, and training of all the Town staff, the Urban Forester also advises other departments with operational tree management issues. Opportunities for this kind of cooperation is limited due to the need of the urban forester to focus on the primary Planning Department job duties, and are generally only in reaction to an existing problem. Departmental divisions may hinder long-term, proactive coordination.

The Tree Commission is also supported by the Planning Department. The Commission assists the Urban Forester, Planning Department, Town Council, and the citizens with a variety of urban forest projects, studies, education programs, and planning. This Commission is authorized and assigned responsibilities in Section 2.96 and 2.97 of Article X, *Tree Commission*, in the Town Code.

The Planning Department also supports other boards and commissions. The decisions, policies, and actions of the Planning Commission, Board of Architectural Review, and Environmental Advisory Commission can have positive and negative influences on public trees.

4.1.3 Department of Engineering and Public Works

This department has direct responsibilities for tree management on public rights-of-way. Tree pruning and removal, stump removal, leaf collection, and woody debris disposal are all duties assigned to Engineering and Public Works. Additionally, the Department's Right-of-Way and Adopt-A-Street permits regulate street tree planting and protection. Construction or repair of utilities and other public infrastructure components and any subsequent damage to street trees and their root systems are monitored and enforced by Engineering and Public Works staff.

This department indirectly affects public trees through their mowing responsibilities, snow and ice removal activities, street, curb, and sidewalk repair work, and water quality programs.

Of all Town agencies, the Department of Engineering and Public Works has the greatest equipment inventory and staffing level for actual public tree maintenance. The Department also utilizes contractual services for tree maintenance tasks.

Although this department has direct control of street tree maintenance and planting, there is no staff position with formal arboricultural education, training, or experience. The department is under a mandate to consult with the Urban Forester on tree issues, but often the communication process fails or the Urban Forester does not have the time to offer complete professional consultations, perform field or project inspections, train Department staff, and other management tasks. To accomplish urban forestry maintenance tasks, the Urban Forester, in fact, must make interdepartmental requests for street tree maintenance services, which then must be considered and weighed against other Engineering and Public Works work priorities.

4.1.4 Office of Capital Projects Management

The Office of Capital Projects Management (OCPM) manages overall design and construction of the Town's capital improvement projects. This department's plans and projects can have long-term impacts on the urban forest. The design of new streets and Town infrastructure projects and the implementation of major repair and improvement projects both affect existing public trees and influence the planting of future trees.

This department has made noteworthy improvements in considering the impacts of their projects on the Town's urban forest resource. Primarily, the department has adopted a no net loss of trees policy and goal for their capital projects. OCPM has recently requested contractual arboricultural services to assist them with project management and compliance. The duties of this qualified contractor include pre-construction tasks, such as plan review, tree protection recommendations, tree inventory, risk, and value assessments, and construction tasks, such as tree and landscape monitoring, mitigation recommendations, and site inspections. In addition, OCPM has prepared a draft tree policy that will affect how public trees are considered and managed; this policy should be periodically reviewed by the Town Urban Forester.

Capital improvement project budgets can include funds for tree maintenance and/or remediation after construction is complete, and may include tree planting as part of the projects. The Urban Forester does not have officially designated review duties for OCPM projects, but is involved in the review process and has consulted with OCPM staff on a limited basis. The Urban Forester also does not have direct input on the use of OCPM tree funds and contractual Certified Arborist staff.

4.1.5 Department of Utilities

The Utilities Department mission is to provide citizens with high-quality water and sanitary sewer service. There are five divisions—Water Supply, Water Pollution Control, Utility Lines, Utility Administration, and Utility Maintenance.

The Utility Lines Division's operations are most impacted by existing trees and, simultaneously, also have the greatest impact on trees, especially the Town's future goal of an accelerated public tree planting program. The Division maintains and repairs all sanitary sewer and water distribution lines that have been accepted into the Town's system. In addition, the Division is responsible for new service installations and locating water and sewer lines for contractors working in the Town's service area.

Trees and underground sewer and water utilities have been considered mutually exclusive for decades. There is a perception that all tree roots cause line breaks which then allows for root intrusion and blockages. Repairs and maintenance are more difficult when mature trees are present.

The Utilities Department primarily locates their facilities under the street and not in conflict with potential tree planting areas. However, with the increased growth, new systems may be placed in vegetated easements, and there is a current policy that no trees can be planted over utility lines.

The management of the Utilities Department does consult with the Urban Forester to minimize disturbance and damage to existing trees, and is currently working to refine guidelines for future tree planting in utility easements.

The Utilities Department has several innovative programs that complement the Town's urban forestry program and goals:

- The Department works to preserve existing mature trees on private and public property by inspecting the entire sanitary sewer system on a six-year cycle and, as part of this preventative maintenance program, every sewer main is cleaned and all debris and roots removed rather than recommending the removal of a private or public tree.
- The Town is a member of Miss Utility, an underground utility protection service. This service is free and allows citizens, private contractors, and Town departments to have all underground utilities located and marked before any excavation project starts. This is an excellent program and should be used with all public and private tree planting projects and tree preservation efforts.
- The Department offers a recycled soil amendment from its sanitary sewer operations, Tuscarora Landscaper's Choice. Using this product would enhance the Town's tree planting program, encourage the Utility Department's excellent program, and ultimately support the ongoing efforts in the protection, restoration, and preservation of the Potomac River and Chesapeake Bay watersheds.

4.1.6 Airport

Leesburg owns and operates its own municipal airport. The airport necessarily occupies much of the publicly owned land within the Town. While there are some opportunities for urban forest enhancement activities on airport property, such as landscape tree planting in parking areas and around buildings and reforestation of land not in the regulated flight path, these opportunities are limited due to the nature of the service and safety issues.

4.1.7 Mayor and Town Council

The Town of Leesburg operates under the Council-Manager form of government. The Town Council is the legislative body of the Town and is empowered by the charter to make Town policy. The Council is composed of the mayor and six council members elected at large on a non-partisan basis.

These elected officials are key to the growth and success of the Town's urban forestry program. As the ultimate policy-making group and representatives of the citizens, the mayor and council can have direct influence over the current and future management of the urban forest. They can approve new and improved tree ordinances, support increases in program funding, support additional staffing levels, and generally make urban forestry issues a priority for the Town.

Sections 11.28 (c) and 11.31 of Article I in the Town Code briefly acknowledges public trees and regulates their protection against damage.

4.1.8 Town Manager

The Town Council appoints the Town Manager to serve as chief executive officer of the Town, carrying out the policies established by the Council. Generally, the manager prepares a budget for the Council's consideration, recruits, hires and supervises the municipal staff, and serves as the Council's chief advisor.

In a council-manager form of government, the Town Manager plays a key role in the success of an urban forestry program. As chief executive officer, the manager can reorganize staffing and department responsibilities to better support urban forest management, re-allocate existing funding and seek new sources of funding, and make policies and administrative regulations for urban forest planning, tree maintenance and planting, and interdepartmental communication and coordination.

4.2 Analysis of Current Tree Management Structure

Leesburg's goal is to have a larger, healthy, diverse, and functional urban forest and thriving residential and business communities. The dynamics of balancing urban forest management and other Town needs, responsibilities, and assets are diverse and complex and suggest a dedicated, interdisciplinary, flexible approach and organization.

However, the current constraints for comprehensive and effective urban forest management in Leesburg can be considered formidable.

4.2.1 Budget

The lack of dedicated and adequate financial resources for the urban forestry program preclude making significant improvements to the program. Currently, there is no line-item or designated regular funding for tree planting, preventive tree maintenance, increased staff and support personnel, or equipment.

Existing public funds for urban forest management are dispersed among various departments for various tasks, and are usually expended only on an emergency basis, by limited citizen requests, for individual capital projects, or for limited aspects of urban forest management, such as development site inspection. The Urban Forester position does not have management authority over dedicated funds for comprehensive urban forest management activities, nor control and input on the expenditures made by other departments.

4.2.2 Policy

The Town of Leesburg has no over-arching administrative or regulatory policy for managing the public urban forest. The Town Code briefly mentions public trees and prohibits their damage, and, although there is a detailed Tree Conservation Ordinance (Section 10.1-1127.1) as allowed by the Commonwealth of Virginia, Leesburg primarily uses this as the basis for policies, regulations, and enforcement of urban forest protection on private property during development. There is no ordinance detailing the Town's responsibilities for public trees, protection of public trees, enforcement and penalties for violations, or planting guidelines and processes.

Without an ordinance or formal policy authorized by Council or without an administrative policy from the Town Manager, there is only limited coordination, efficient, and comprehensive urban forest management program. Independent departments and agencies can continue to function and interact with little or no cooperation from each other. This can lead to inefficient duplication or overlapping of efforts and/or the opposite, underlapping, where areas of responsibility and needs go unmet.

The lack of a Town urban forestry management policy can allow Town agencies to operate with conflicting or inadequate urban forest management standards. The lack of a policy also means there is no measure by which to judge the Town's actions as successes or failures.

4.2.3 Fragmentation

Although several Town agencies consider some aspect of urban forest management, planning, and control to be within their scope, they actually concentrate on only a part of the urban forest and lack a comprehensive perspective. Fragmentation, or separation defined by organizational boundaries and agency-specific missions, may keep the Town's departments from interacting in meaningful and productive ways to protect and enhance the urban forest.

4.2.4 Leadership

The effectiveness of an agency is, in part, a function of its leadership. Without strong, supportive leadership, or if the leadership is in an unempowered position in the organization, urban forestry goals will struggle to be met. Whether in direct or indirect control, centralized or decentralized, the Town's administrative leadership of urban forestry needs to be recognized, focused, dedicated, and supported.

4.2.5 Technical and Professional Resources

An adequate complement of professionals who, individually or collectively, understand the technical, operational, and administrative factors in urban forest management is needed to prescribe and monitor the Town's urban forestry activities, enforce policies and regulations, apply technical standards and practices, and review plans that affect the forest resource. Without this professional component in sufficient numbers, urban forest management decisions and actions often default to inadequately prepared decision-makers, which can have long-term, negative consequences for the forest resource.

4.2.6 Political Support

Support from elected officials and the citizens is critical to implement and maintain an effective comprehensive urban forest management program. The citizens own both the public and private urban forests, and without greater political support and increased citizen understanding and commitment, urban forest management in Leesburg may not reach its full potential.

4.3 Management Structure Recommendations

A comprehensive, progressive, and proactive urban forest management program requires the coordination of professional talents in land use planning, public works, forestry, parks, and other public services. It requires political, administrative, and private entities to be educated and involved in urban forestry matters. It also requires sufficient funding to allow for professional management responses to a comprehensive urban forestry policy.

The reaction of many local governments to these requirements has been to reevaluate and/or reorganize the structure of the organization so that appropriate solutions might be developed, tested, and implemented to better control and maintain municipal forest resources.

Urban forest management can be as complex, vibrant, diverse, and fragile as the urban forestry ecosystem itself. Just as one silvicultural technique is best suited for a particular forest stand, that same technique fails miserably when applied to a different stand. And so it is with urban forestry management. Leesburg should not simply duplicate what other cities have done.

The Administration should propose and Council should approve a Public Tree Ordinance to include in the Town Code. A public tree ordinance would clearly state the Town's acknowledgement and responsibility for all trees on public property, would express the Town's commitment to public tree care and preservation, and would identify and define the centralized authority for urban forestry issues. This ordinance would also be a legislative representation of the Town's policy of urban forest management.

The adoption and enforcement of the ordinance would support a change away from the current problem-specific, crisis management, and reactive approach to a more proactive, holistic management response. The lack of this ordinance and policy statement can allow Town agencies to act independently without regard to duplication or underlapping, hinders attempts to coordinate the action of Town agencies regarding the proper management of public trees, and confuses interaction of the Town with citizens, businesses, utilities, and other outside entities when dealing with public trees. An example of a recommended ordinance for Leesburg is found in Appendix D. The Town Attorney should review this ordinance and determine its compliance and suitability under the Dillon Rule.

The Town should find means to increase interdepartmental communication and cooperation for plans and projects that may affect the urban forest. Without information on public and private projects, and enough time to review and comment on these plans and projects, potential problems may occur and opportunities will be missed that have immediate and long-term impacts on the urban forest.

Other municipalities have formalized the communication process by creating a Town departmental review and approval system for major projects. Plans or project descriptions of new construction or major repair projects (not routine departmental tasks) are circulated through each department for review and comment. Each department can weigh the impact the particular project has upon its responsibilities and comment on the project. The project cannot be implemented until all departments have approved the project as planned or requests for changes have been satisfied. Another mechanism to increase communication is for representatives from all departments (as needed) to be invited to a pre-construction meeting. At this meeting, the Urban Forester can personally interact with Town staff and private contractors who will be involved in the project.

The Urban Forester should be officially designated as part of the review, comment, and recommendation process.

The Urban Forester and urban forest management operational duties, resources, authority, and responsibility should be centralized in one department. Currently, public tree management is divided by departmental lines with each agency making decisions, spending resources, and taking action (or inaction) on the public trees in the properties and projects under their control. The Urban Forester and future program staff should be located in the department that has the most immediate impact on the public urban forest and the implementation of the *Urban Forestry Management Plan*, and the Town Manager should enable the Urban Forester to be the key decision-maker in projects that affect the urban forest in any way.

The staffing levels and resources for urban forest management should be increased. A truly proactive and comprehensive urban forest management program requires trained and dedicated staff to oversee management and operational activities. The important duties of tree planting, tree maintenance, emergency response, plan review, development site inspection, project management, contract administration, interagency assistance and coordination, and citizen education, among others, require a sufficient level of staffing, equipment, and other program resources.

A job analysis could be performed to determine if new or existing job classifications should be created, whether existing staff could be trained and reassigned or if new hiring is needed, and what level of funding is needed to support the positions. An operational review of urban forestry activities could be performed to document work processes, work quantities, personnel, use or absence of arboricultural standards, and to inventory existing equipment, tools, and office equipment. The findings and recommendation of both the job analysis and operational review are critical sources of decision-making information and baseline data for judging future success or shortcomings of the urban forestry program.

Funding levels for an expanded public tree planting and maintenance program should be increased. The current financial resources from both private and public funds are not adequate to professionally and comprehensively manage and maintain Leesburg's urban forest. No dedicated or consistent funding is available for increased public tree planting, for routine and preventive maintenance, for insect and disease monitoring and control, and other necessary tasks. It is recommended that a detailed budget analysis be performed that includes:

- Identifying all Town resources spent on urban forestry activities to clearly understand the current level of funding for urban forestry related activities.
- Determining if future budget reallocations and efficiencies can occur.
- Determining the amount of the shortfall to achieve the *Urban Forestry Management Plan* goals.
- Identifying potential and best sources of increased financial resources.

Recommendations

1. *The Administration should propose and Council should approve a Public Tree Ordinance to be included in the Town Code.*
2. *The Town should find means to increase interdepartmental communication and cooperation for plans and projects that may affect the urban forest.*
3. *The Urban Forester and urban forest management operational duties, resources, authority, and responsibilities should be centralized in one department.*
4. *The staffing levels and resources for urban forest management should be increased.*
5. *Funding levels for an expanded public tree planting and maintenance program should be increased.*

4.3.1 Management Structure Summary

In summary, proactive and proper urban forest management can result when the Town of Leesburg has a clear and focused urban forestry ordinance and policy, an improved organizational structure, an appropriate staffing level, and adequate financial resources. With these improvements, the Town will realize many benefits:

- More efficient management of public trees
- Correct timing of operational maintenance and expense
- Better capital budgeting
- More effective and quicker response to interagency and citizen service requests
- Confidence in decision-making between various management options
- Increased cooperation and support internally and externally
- A healthy, safe, and growing urban forest

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5.0 Leesburg Public Tree Inventory

Leesburg contracted to have an inventory of public trees on streets, parks, and other public properties performed in phases from 1999 through 2004. This project resulted in data for approximately 2,900 sites. At this time, the inventory is not complete. Not all public trees were inventoried, no work histories have been entered into the database, new tree plantings have not been recorded, and no condition and maintenance inspection updates have been performed.

However, this inventory does provide useful information for preliminary analysis on the state of Leesburg's public urban forest and for determining appropriate future tree planting and maintenance work plans. It should be understood, that because of the lack of some data, the statistical calculations will understandably be somewhat skewed. The numbers and figures presented should be considered qualitative and indicative of general conditions and trends.

Summary of the Leesburg Public Tree Inventory Analysis

The Town of Leesburg provided Davey Resource Group with data of previous inventories yielding 2,900 trees, planting sites, and stumps in Leesburg. Data were analyzed to discover information on the species composition, relative age, health, and to make preliminary maintenance recommendations for the Town's urban forest (Appendix F).

The major findings of the Leesburg Tree Inventory include the following:

- *There were 2,900 total sites inventoried. Of these, 1,786 (61.6 percent) are public space trees, 1,001 (35.5 percent) are street trees, 102 (3.5 percent) are planting sites, and 11 (0.4 percent) are stumps.*
- *59 genera and 99 species are represented in the inventoried trees.*
- Acer *spp. (maple) comprises 12.5 percent of the inventoried tree population, with* Quercus *spp. (oak) contributing 9.9 percent,* Cornus *spp. (dogwood) 9.8 percent,* Picea *spp. (spruce) 8.6 percent,* Pinus *spp. (pine) 8.6 percent,* Prunus *spp. (cherry) 4.2 percent,* Pyrus *spp. (pear) 4.1 percent,* Zelkova *spp. (zelkova) 3.2 percent,* Cupressocyparis *spp. (cypress) 3.1 percent,* Malus *spp. (flowering crabapple) 2.9 percent, and* Ulmus *spp. (elm) contributing 2.6 percent.*
- *The inventoried tree population has high percentages of small- and medium-sized trees. Small-sized trees, which are classified by diameter at breast height of 6 inches and less, represent 59.6% of the street tree and public space tree population. Medium-sized trees, which are 7 to 24 inches in diameter, represent 38.0% of the street trees and public space trees. Only 2.4% of the street trees and the public space trees are large-sized (25 inches and greater in diameter).*
- *Of the inventoried tree population, there are 18 trees (0.7%) rated in Excellent condition, 1,476 (52.9%) in Good condition, 961 (34.5%) in Fair condition. 304 (10.9%) in Poor condition, 10 (0.4%) in Critical condition, and 18 trees (0.7%) are rated as Dead.*
- *Of the maintenance recommendations in the inventory, there are 57 trees (2.0%) recommended for removal. Of these, 20 (0.7%) are recommended for Removal 1, and 37 (1.3%) are recommended for Removal 2. A total of 11 (0.4%) stumps are in need of grinding.*
- *Of the pruning maintenance recommendations in the inventory, there are 13 (0.5%) trees recommended for Prune 1 and 80 (2.9%) recommended for Prune 2. Large Routine Prune is recommended for 851 (30.4%) trees, Small Routine Prune is recommended for 1,211 (43.3%) trees, and Training Prune is recommended for 550 (19.7%) trees.*

5.1 Public Tree Inventory Analysis

The following sections of this document provide a proposed comprehensive action plan for Leesburg's inventoried public tree population. The discussion includes an analysis of the current tree population, growing environment, and recommended maintenance needs. Specific, long-range management recommendations, such as strategies for tree care, disease, and insect monitoring, and tree preservation, will be discussed in Chapter 6, *Urban Forestry Management Recommendations*. Generally, the scope of this discussion includes:

Inventory Analysis Results

- *Gain an overall understanding of the inventoried tree population in terms of genus and species composition.*
- *Identify trees with structural or other defects that could cause them to be or become potential safety risks to citizens, vehicles, and/or property.*
- *Analyze the individual and overall health and condition of the inventoried tree population.*

- Summary and analysis of the tree inventory
- Description of the species composition
- Discussion of the general condition of the street and public space trees

The urban forest in Leesburg is a complex system of trees, site conditions, and maintenance recommendations. Understanding this system is important for proper decision-making regarding species selection and tree care practices. This chapter provides insight into the current composition and condition of Leesburg's inventoried tree population. Where appropriate, the data will be presented and analyzed by the total population and by street and public space trees. Specific information detailed includes:

- Species Composition and Diversity
- Size Class Distribution
- General Health and Condition
- Tree Maintenance Recommendations
- Other Data Fields
- Tree Inventory Concern

By accumulating, updating, and using this information, urban forest managers can forecast trends, anticipate maintenance needs, facilitate budgeting for tree-related expenditures, and develop a basis for long-range planning. This is necessary to ensure a stable and diverse tree population for the coming years and to plan for future tree planting operations.

The characteristics of the urban forest include species, diameter, condition, and other related tree and site factors. By identifying the species, diameter, and condition of trees in the urban forest, one can learn much about the forest's composition, relative age, and health. It is important to know the kinds of trees as well as the number of trees present in the Town. Species composition data are essential because tree species vary considerably in life expectancy and maintenance needs. The types of trees present in a community greatly affect tree maintenance activities and budgets. Similarly, tree diameter and size class data help to define the general age and size distribution of the total tree population.

5.2 Species Composition and Diversity

As shown in Appendix F, the inventoried population of street and public space trees is composed of 2,787 trees distributed among 59 genera and 99 species. Tables 1 and 2 show that 10 species comprise 63% of the street tree population and 55% of the public space tree population, respectively.

Generally, in the field of urban forestry, it is recommended that no one species should account for more than 10% of the total population. Furthermore, no single genus (a genus is a group of closely related species) should account for more than 20% of the total population. Leesburg's inventoried tree population exhibits a good distribution among genera, and future plantings should be planned to maintain this balance (Figure 6).

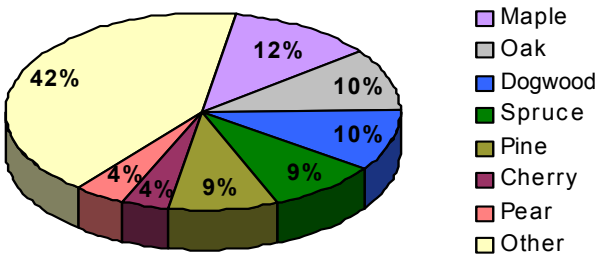


Figure 6. Leesburg's Distribution of Trees by Genus

Table 1. Significant Species Composition of Leesburg: Street Trees

Scientific Name	Common Name	Number	Percentage
Cornus kousa	Kousa dogwood	228	22.8
Quercus palustris	pin oak	71	7.1
Pyrus calleryana	callery pear	65	6.5
Prunus serrulata	Japanese flowering cherry	50	5.0
Acer rubrum	red maple	45	4.5
Fraxinus pennsylvanica	green ash	44	4.4
Platanus acerifolia	London planetree	39	3.9
Zelkova serrata	Japanese zelkova	32	3.2
Acer platanoides	Norway maple	30	3.0
Ulmus parvifolia	Chinese elm	25	2.5
Totals		**629**	**62.9**

Table 2. Significant Species Composition of Leesburg: Public Space Trees

Scientific Name	Common Name	Number	Percentage
Acer rubrum	red maple	194	10.9
Picea abies	Norway spruce	191	10.7
Pinus nigra	Austrian pine	146	8.2
Cupressocyparis leylandii	Leyland cypress	85	4.8
Pinus strobus	eastern white pine	71	4.0
Illex spp.	holly	62	3.5
Morus rubra	red mulberry	61	3.4
Zelkova serrata	Japanese zelkova	57	3.2
Malus spp.	flowering crabapple	55	3.1
Quercus rubra	red oak	54	3.0
Totals		**976**	**54.6**

Davey Resource Group recommends that the Town of Leesburg plant a wider range of species by including both native and non-native, urban-tolerant species. Planting a large number of trees of the same species (monoculture) can lead to catastrophic results. A good example of this situation was the dominance of American elm (*Ulmus americana*) in American cities in the twentieth century. When Dutch elm disease (*Ceratocystis ulmi*) arrived in the United States in the 1930s, the resulting tree losses were devastating. Similar scenarios are now foreseeable for the Asian long-horned beetle and emerald ash borer.

5.3 Size Class Distribution

Tree species have different life spans and mature at different diameters, heights, and crown spreads. This means that actual tree ages cannot be assumed from the diameters of trees. However, general classifications of size, such as small, medium, and large, can be used to describe the general characteristics of the urban forest. This is not a substitute for age classes, which can give the actual age and maturity of trees, but it can provide a general idea of the variability in Leesburg's tree population.

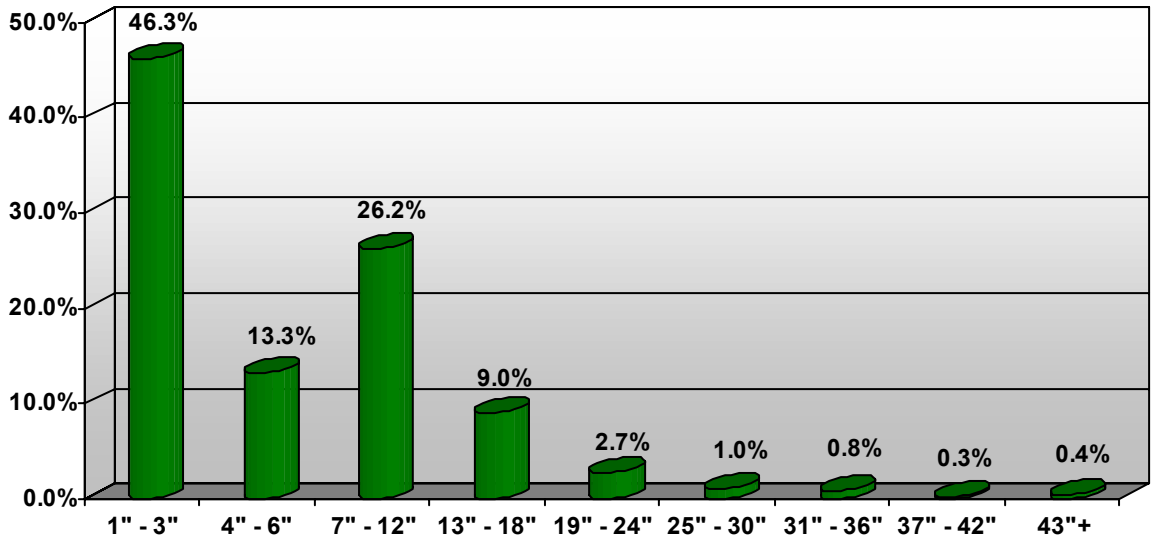


Figure 7. Diameter Size Class Distribution of Leesburg's Inventoried Tree Population

As illustrated in Figure 7, small trees, 6 inches or less in diameter, represent approximately 59% of the total tree population inventoried in Leesburg. Dogwoods (*Cornus* spp.), spruces (*Picea* spp.), and maples (*Acer* spp.) account for the majority of these trees. It must be understood that *small trees* does not mean that all trees in this class are of small growth-habit. For example, the spruces that are in this group are simply young, recently planted trees. These trees, under normal conditions, will mature to medium- or large-sized trees from 45 to 90 feet in height. However, the dogwoods have growth habits in which they mature at heights from 20 to 30 feet and diameters of 8 to 15 inches. These trees have a relatively short life span in the urban environment compared to larger maturing oaks (*Quercus* spp.) and maples.

***Species diversity** alone is not sufficient to maintain a stable urban forest.*

The extent to which each species is adapted to the site conditions and local climate in Leesburg also determines the general health and longevity of the tree population. Accounting for diversity, urban tolerance, and stability of the urban forest, the mix of species currently used in Leesburg represents a fair group for street and public space tree usage. Emphasis should be made to utilize lesser-used species in future tree plantings in order to improve the percentages of species representation and maintain good diversity. In addition, importance should be placed on the use of large-growing shade trees for future public plantings to improve stability of the urban forest and maximize tree benefits and effectively distribute future maintenance costs.

Young, deciduous trees must be properly trimmed to encourage good growth habit and to minimize future maintenance needs as the trees mature. Although maintenance needs are more intensive in young trees, this care can be performed efficiently by ground crews and without costly equipment (see Chapter 6.3, *Young Tree Care*, for more information).

Roughly 38% of the inventoried urban forest falls under the medium-sized classification with a diameter range of 7 to 24 inches. Pines (*Pinus* spp.), oaks, and maples dominate this size class.

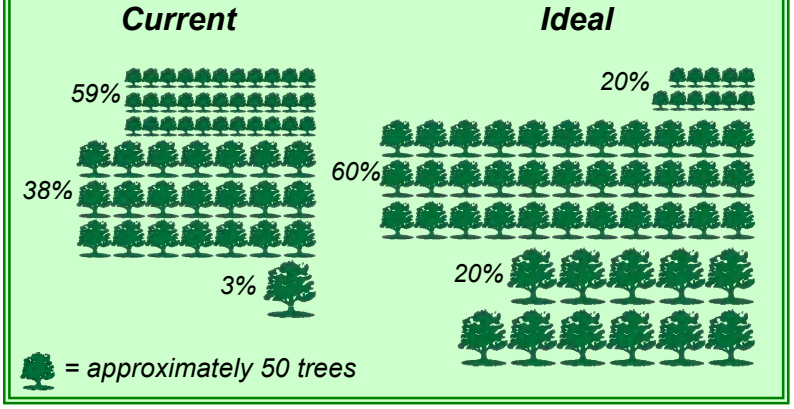
Large trees, 25 inches and greater in diameter, comprise almost 3% of Leesburg's inventoried tree population. Red mulberries (*Morus rubra*), maples, black walnuts (*Juglans nigra*), and Ohio buckeyes (*Aesculus glabra*) dominate this size class.

Keeping the factors above in mind, it becomes clear that planning for tree planting in Leesburg requires careful consideration of species selection. The small size class should be composed of both long-lived species and smaller, shorter-lived species, addressing the need for less maintenance and the desire for such characteristics as spring flowers and fall color. Proper tree maintenance should be carried out to ensure the health and longevity of the trees, especially those with good maturity potential. This includes fertilizing, watering, and training pruning when young. See Appendix G for suggested tree species recommended for planting in Leesburg.

Normal recommendations in urban forestry management call for achieving, over time, an appropriate age mixture by removing and replanting a certain percentage of trees each year. A good ratio for an urban tree population is a 20:60:20 mix of small, medium, and large trees, reflecting the percentage of trees in each size group and representing a uniform spread of tree ages from young to mature to overmature.

Leesburg's Recommended Size Class Ratio

Leesburg's current urban forest is approximately a 59:38:3 mix of small, medium, and large trees, or 1,660 small trees, 1,059 medium trees, and 68 large trees (as shown on the left). The figure to the right shows what Leesburg's urban forest should be—a mix of 557 small trees, 1,672 medium trees, and 557 large trees.



5.4 General Health and Structure

The condition of a tree is evaluated by considering several factors, including, but not limited to, root characteristics, trunk, branch structure, canopy, foliage, and presence of pests.

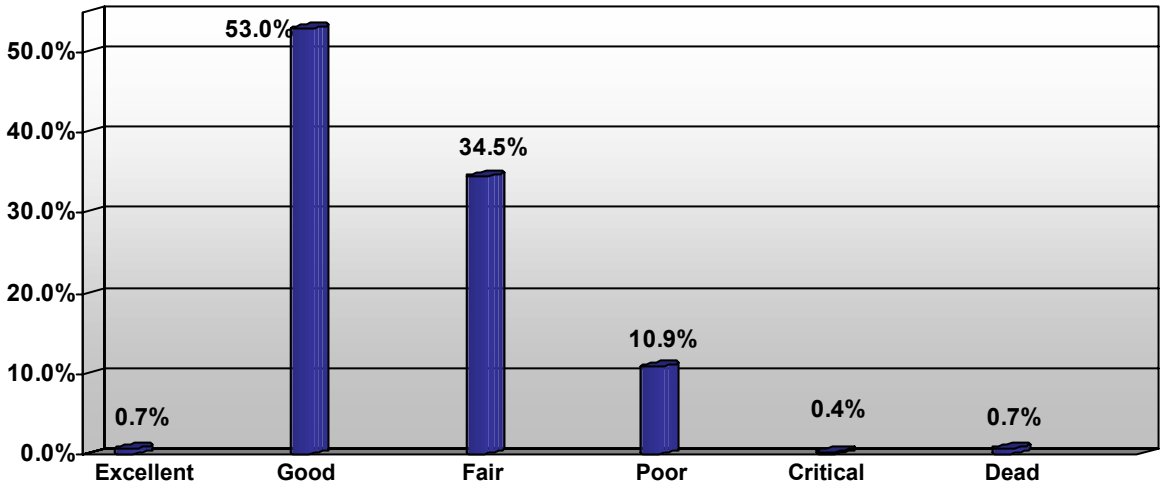


Figure 8. Leesburg's Tree Conditions

As shown in Figure 8, a significant portion of Leesburg's tree population is in good health. Dead trees and trees in poor and critical condition comprise approximately 12% of the total inventoried population. Dogwoods, spruces, and maples have the highest numbers of trees listed in poor, critical, or dead condition classes.

To improve the overall condition of the urban forest, Davey Resource Group recommends that Leesburg avoid using inferior tree species for public space plantings, such as silver maple (*Acer saccharinum*) and red mulberry (*Morus rubra*), because of several unfavorable characteristics when applied to a public setting.

Characteristics of Inferior Trees

- *Fast growing and weak-wooded species subject to breakage in high winds*
- *Messy trees with heavy fruit production and high amounts of small deadwood*
- *Poor compartmentalizers subject to rapidly developing decay and hollow*
- *Prone to fungal and insect infestations*

The poor and critical condition ratings given to mature trees are generally due to visible signs of decline and stress including, but not limited to, decay, dead limbs, sparse branching, or poor structure. Where physical damage has occurred, these trees may also become more susceptible to diseases and other problems.

These kinds of stresses can also make trees more prone to pest problems by providing access to internal wood tissue. If a tree is already stressed, the additional injury can substantially reduce the tree's ability to sustain defense mechanisms and maintain growth. When trees are in good health, most have the ability to withstand pest or disease problems but, with the onset of stress and/or decline, they are less likely to produce sufficient energy for growth and survival and can succumb rapidly.

A poor condition rating given to young or newly planted trees is often due to severe physical damage or to a failure to thrive after planting. Young trees can be seriously impacted by physical damage from vehicles, lawn mowers, string trimmers, and poor pruning practices and are often vandalized because of their small size (which makes them an easy target for destruction).

When maintaining public trees, it must be realized that the potential for loss is an important factor in prioritizing treatments and making effective use of available funds. Monitoring the condition of significant trees and making efforts to maintain their health is essential. The loss of trees over time is an inevitable natural process. However, to control the decline, removal, and replacement of trees in a timely and cost-effective manner is the goal of the management process.

5.5 Tree Maintenance Recommendations

The highest priority maintenance recommendations that were identified primarily pertain to protecting public safety. All pruning and removal maintenance recommendations were based on the existence of potential safety risks to the citizens of Leesburg and/or their property.

Other maintenance activities could be identified, such as insect or disease treatments or fertilization; however, this information was not collected as part of the inventory. The inventory identifies those maintenance activities that are of greatest importance to the overall management of the total tree population.

Maintenance Activities

High priority activities to reduce risk of injury or property damage:

- *Removal 1 and Removal 2*
- *Reinspect*
- *Prune 1 and Prune 2*

Practices to improve the overall health, longevity, and aesthetics of the urban forest:

- *Large Routine Prune*
- *Small Routine Prune*
- *Training Prune*
- *Stump Removal*

Current urban forest maintenance recommendations were determined from the previous inventories' data on observations of the trunk, scaffold branches, and canopy of each tree, as well as the tree's location to streets, sidewalks, utilities, signs, buildings, and traffic control devices.

Maintenance data should be used as a basis for prioritizing activity needs. This information will allow Leesburg to develop cost-effective strategies by assisting all relevant Town officials with an accurate evaluation of current and future tree-related expenditures.

Table 3 shows that a majority of the tree maintenance work needed in Leesburg involves non-priority pruning activities. Approximately 93% of the total inventoried tree population requires either routine or training pruning. However, since Leesburg's first priority is the safety of its citizens, removal and pruning activities that are considered a high priority will be discussed next.

Table 3. Leesburg's Total Tree Maintenance Recommendations

Maintenance Required	Number of Trees	Percent of Trees
Removal 1	20	0.7
Removal 2	37	1.3
Reinspect	25	0.9
Prune 1	13	0.5
Prune 2	80	2.9
Large Routine Prune	851	30.4
Small Routine Prune	1211	43.3
Training Prune	550	19.7
Stump Removal	11	0.4
Totals	**2,798**	**100**

5.5.1 Tree Removals

Trees fail from natural causes, such as disease, insects, and weather conditions, and from physical injury due to vehicles, vandalism, poisoning, and root disturbances, among others. Trees recommended for removal in the existing inventory are those that may be potential safety risks or are in such poor condition that they are likely to fail or die within the next few years.

Why Remove Hazardous Public Trees?

- *Eliminates or reduces risks to persons and property*
- *Eliminates breeding sites for insects and diseases*
- *Improves aesthetics*

Of the total trees inventoried, 20 (0.7%) are recommended for Removal 1 and 37 (1.3 %) are recommended for Removal 2 (Table 3). Most of these trees are red mulberries, dogwoods, maples, and callery pears (*Pyrus calleryana*). As shown in Figure 9, more than 50% of the trees recommended for removal are less than 6 inches in diameter. The prompt removal of these trees will reduce liability through the decreased likelihood of tree failure.

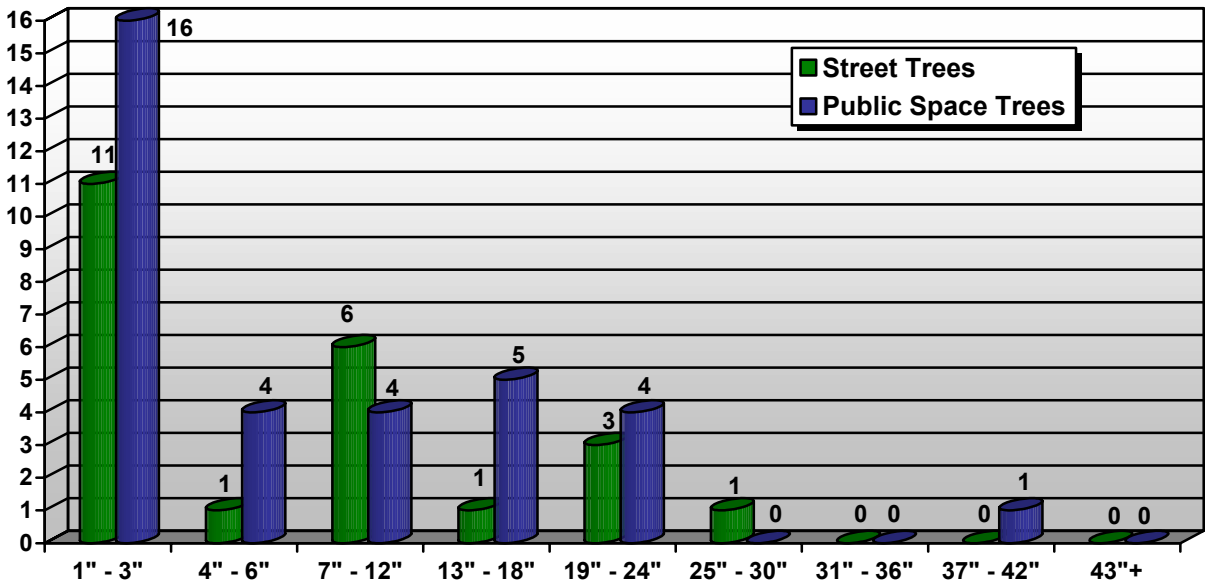


Figure 9. Number of Tree Removals by Diameter Size Class

5.5.2 Reinspect

There are 25 (0.9%) trees recommended for Reinspection (Table 3). Many of these trees are in poor to critical condition and have decay to an undetermined extent. Other instances in which a tree would be recommended for further inspection include major structural defects and/or the need to re-evaluate risk factors. Many of these trees may be candidates for removal. A Certified Arborist should perform these inspections on an annual basis.

5.5.3 Priority Pruning

Priority Pruning consists of the removal of dead, dying, weak, or otherwise hazardous branches on the main trunks, as well as those within the canopy area, of trees. A tree recommended for Priority Pruning has some increased level of risk associated with the defective branch or tree part. Usually this translates into an increase risk of failure and the presence of a target (person or property). As shown in Table 3, 93 (3.4%) of the inventoried trees in Leesburg are current candidates for Priority Pruning. All Priority Pruning recommendations should be addressed as soon as possible to reduce the risk of failure and the potential damage it may cause.

Prune 1 is the removal of dead, diseased, or obviously weak, heavy, or hazardous branches which are generally greater than four inches in diameter. As shown in Table 3, 13 (0.5%) inventoried trees in Leesburg require Prune 1 work to reduce potential hazards and liability. Mature maples and oaks account for the majority of this maintenance type. The relatively low number of trees recommended for Prune 1 could be an effect of the unbalanced mix of relative age classes of Leesburg's public trees. The majority of Leesburg's public trees are small-growing and/or immature trees. These small trees generally do not have an increased level of risk associated with their maintenance needs, *i.e.*, they are not large enough to require a type of priority pruning.

Prune 2 is the removal of dead, diseased, or obviously weak, heavy, or hazardous branches that are generally between two inches and four inches in diameter. As shown in Table 3, 80 (2.9% trees require this type of maintenance. Green ash (*Fraxinus pennsylvanica*), pines (*Pinus* spp.), and oaks account for the majority of this maintenance type.

All trees in these pruning categories should be examined closely during trimming operations for severe internal decay or dieback. If, upon closer inspection, these trees are found to be severely decayed, they should be removed. The trees requiring trimming for risk conditions should be attended to as quickly as possible, starting with the greatest risk trees first.

5.5.4 Routine Pruning

Routine Pruning consists of the removal of dead, dying, diseased, interfering, objectionable, and weak branches on the main trunks, as well as those within the canopy area, of trees. As shown in Table 3, 2,062 (73.7%) of the inventoried trees in Leesburg are candidates for a Routine Prune. A systematic routine pruning cycle of all Town trees should be implemented to decrease the occurrence of potentially dangerous broken branches and large deadwood.

Large Routine Prune includes large growth habit trees requiring routine horticultural pruning to correct growth patterns that would eventually obstruct vehicular or pedestrian traffic or interfere with utility wires or buildings. Trees in this category are large enough (or will grow large enough) to require bucket truck access or manual climbing. As shown in Table 3, 851 (30.4%) of Leesburg's inventoried trees require this type of maintenance.

Small Routine Prune includes small growth habit trees requiring routine horticultural pruning to correct growth patterns that would eventually obstruct vehicular and pedestrian traffic or interfere with buildings. Trees in this category may be mature trees, but are small enough that they can be pruned from the ground. As shown in Table 3, 1,211 (73.7%) of the inventoried trees require this type of maintenance.

Small Routine Pruning

Although many of these recommendations are low priority, they can become high priority liabilities if neglected for an extended period.

Trees requiring routine pruning generally do not present an immediate risk of hazard. This will allow Leesburg to budget and schedule most of its tree maintenance projects in a cost-efficient and timely manner. Pruning guidelines can be found in Appendix H.

Given the modest numbers of coniferous trees in the inventory, such as Norway spruce (*Picea abies*) and Austrian pine (*Pinus nigra*), mention must be made of the unique maintenance needs of these species. Generally, these species do not require cyclical pruning, as do deciduous trees, nor will these trees usually require a training prune when young (except in the case of trees with multiple trunks or those with codominant leaders).

5.5.5 Training Pruning

Training, or pruning to shape, consists of the removal of dead, dying, diseased, interfering, conflicting, and/or weak branches, as well as selective trimming to direct future branch growth. This maintenance category applies to all trees less than 20 feet in height that are usually young and newly planted. Trees in this group can be pruned from the ground with a pole pruner. As shown in Table 3, 550 (19.7%) of the inventoried trees require training pruning. Most of these trees are dogwoods, hollies, and oaks.

5.5.6 Stump Removal

According to the inventory, 11 (0.4%) stumps require removal in the along the Town's rights-of-way and public properties (Table 3). In most cases, stumps create tripping hazards and are an unsightly feature in the landscape. Stump removal should occur as soon as possible after a tree is removed. Ideally, stump removal should be planned and budgeted for as part of the tree removal process.

5.6 Planting Vacant Sites

Within the inventory, 102 potential planting sites are identified throughout the Town's right-of-way and public spaces. However, this information was recorded at a time when tree planting in the public rights-of-way was discouraged. Now that the Zoning Ordinance and planting policy has changed, trees may be planted in the right-of-way with the approval of the Land Development Official and coordination with the Public Works Department. Public opinion also strongly supports planting more street trees.

It is unknown and difficult to estimate how many potential planting sites there are in Leesburg's parks and other public properties. Without an additional inventory or site inspection specifically designed toward obtaining this information, determining with certainty the number of trees that could be planted on these properties is problematic.

Stocking

A traditional forestry term measuring the density and distribution of trees.

However, the number of trees that could be planted in the public rights-of-way can be estimated. In eastern cities, an average of 100 trees per street mile can be expected in a fully stocked community. This average number takes into consideration the number of driveways, cross streets, underground utilities, visibility clearance standards, and other factors that dictate tree spacing.

Leesburg has approximately 95 street miles. Therefore, the potential street tree population is 9,500 trees. Using the inventory data, 850 trees currently are found on the streets, and 31 trees are recommended for removal. Based on these estimates, 8,681 vacant planting sites exist on Leesburg's rights-of-way, meaning Leesburg currently has a 9% stocking level.

Davey Resource Group generally recommends that the urban forest in a Town's right-of way should be 90% to 100% stocked, leaving no more than 10% of the planting sites vacant. Based on the tree inventory data, Leesburg is currently 9% stocked. The Town should make every effort to budget for tree planting in the near future so that it may reach the recommended stocking goal.

The Town must carefully determine which tree species will be planted in each vacant site. The suggested species list in Appendix G considers maintenance recommendations, adaptability to specific planting site variables, mature size, and suitability to the restrictive conditions of the urban environment, among other factors. Careful planning is necessary to introduce a level of species variety into the street tree population and compatibility with the other uses and components of the public right-of-way.

A systematic program of maintenance, specifically designed for newly planted trees, is necessary to provide them with the greatest chance of survival. Correct tree planting techniques are crucial since improperly dug planting holes adding significant soil amendments and fertilizers, improperly placed support wires, and other non-standard planting techniques can lead to additional stress and even death of young trees. Further discussion of this issue is located in Chapter 6, *Urban Forestry Management Program Recommendations*, and Appendix H includes proper tree planting and pruning guidelines.

5.7 Maintaining the Tree Inventory

Leesburg's inventory should be updated on a regular basis to reflect new plantings, removals, and maintenance procedures performed. An accurate inventory is the best way for the Town to monitor the progress and cost-efficiency of its tree care operations. The primary benefit of an accurate tree inventory is that the community can budget, plan, and anticipate tree-related problems and situations in the most cost-effective manner possible.

The Town currently has Tree Manager®, a data management software program designed to manage tree inventory data. This software, and other commercially available programs, allows Town staff and even trained volunteers to easily enter data, work histories, and create reports. Since Tree Manager® is no longer supported by the company that developed the software, the Town will need to investigate other tree inventory databases.

The best way to maintain the inventory is to commit to regular, routine data entry. The urban forestry staff could create a simple form for use in the field that contains similar data fields as the software program. This form can easily be used to record new plantings, work histories, changes in tree conditions, and maintenance recommendations. On a daily, weekly, or monthly basis, the information collected should be entered into the inventory database. This task can be performed by the Urban Forester, administrative support staff, or trained volunteers.

It is further recommended that a thorough inventory be performed every ten years or more frequently if rapid changes in the urban forest occur, such as severe storms, serious insect and disease problems, or a dramatic increase in new tree planting. Tree inventories should be performed by a professional urban forestry consultant, a Certified Arborist, or by the Town's Urban Forester. Only a highly qualified professional should make the determinations of condition, safety risk, and maintenance requirements. Volunteers may assist in the inventory process which will increase public awareness and ownership of the urban forest.

Recommendations

1. *Investigate and select other tree inventory database software programs to replace Tree Manager®.*
2. *Commit to routine data entry.*
3. *Create a simple form for use in the field with inventory data fields.*
4. *Perform a thorough inventory of public trees every ten years or as needed.*

5.8 Using GPS Technology to Build GIS Layers

A Geographic Information System (GIS) is a combination of computer hardware and software matched with someone who needs to manage an asset (such as street trees). A GIS can be used to visualize, create, analyze, and manipulate map and attribute data.

A needs assessment is the first step. What features do you want to appear on your maps, and what information do you need to know about those features? Features might include roads, buildings, parcels, right-of-way, and/or trees. What information, or attributes, do you need to know about the features? For trees, it might be species, size, condition, location, and recommended maintenance. Then consider what accuracy is needed. How many people will work with the finished maps? The answers to these questions obviously dictate how to implement their GIS. The cost of building a GIS for use in community forestry will be determined by how many types of features you intend to map, the amount of information you will gather for each feature, the accuracy standards that you choose, and the availability of existing base maps.

A base map is the map layer that shows the major features, such as roads, sidewalks, and buildings. Most communities have hard copy (paper or mylar) maps that show roads and buildings that can be scanned into a digital raster image, or better yet digitized into a vector file. Aerial photographs, especially those that have been rectified to remove any distortion or inconsistencies of scale (called orthophotographs), can be used by themselves or used to add details not shown on existing maps. Other sources of base maps that show your community's major features, such as USGS topographic quadrangles, are frequently available through federal, state, and local government agencies. Electronic CAD drawings can be processed so they, too, are in alignment.

Using GPS for data collection is the most accurate method; however, the costs associated with equipment can be high.

There is a wide range of quality, availability, accessibility, and cost for base maps. When third party GIS data, such as air photos, are used, they are delivered in a specific map projection, which is a mathematical method for depicting the earth's curved surface on a flat computer screen. Think of these projections as different methods of peeling an orange to get the peel to lie flat on the table. Common examples are State Plane or Universal Transverse Mercator (UTM). Find out what projections are available for maps or photos you obtain from outside sources.

Adding features, such as trees, is the next step. A computer, pocket PC, or a PDA ,can be programmed for use in the field, with a data collection program. More powerful, rugged pen units are built specifically for field use. However you gather the information about your features, you'll need to add the features to your map.

Global positioning system (GPS) receivers can be quite accurate, but the accuracy can come at a high cost when you factor in costs of equipment. Often, it can be less expensive to hire a consultant to do the GPS work for you. Pen units and some PDA's can be loaded with your base maps. When you wish to add a new feature, you simply tap the screen where you want the feature to be placed on the map. This method is less accurate than GPS, but if your base map has plenty of features that can be used as reference points, you can place features like trees with desirable results.

Survey grade accuracy may seem like a good idea since a property's boundaries are so measured, but the associated cost and effort may not be worth it, especially when mapping relatively large or numerous features, such as planting sites, stumps, and trees (*e.g.*, if a tree is one foot in diameter, what good is knowing where it is within three inches?). Consideration should be given to which attributes should be inventoried. Aside from the time and cost to collect everything about each feature, keep in mind that someone has to manage the database, so a happy medium between usefulness and quantity should be achieved. The number of people working with the finished system is a major consideration in terms of which people are allowed to edit (change, delete, or add) the data.

A field inventory using a pen-tablet computer (Tablet PC or a PocketPC) uses relatively inexpensive equipment and can provide high accuracy results when combined with good base maps.

Field inventory is the final step and should build off the compiled base map data. First, if GPS technology is used for the inventory, field data can be quickly compared against the base map data to track collection progress and accuracy. Second, if pen-tablet computer technology is used, the base map data can be loaded onto the pen computer and taken into the field. Of the two field collection methods, GPS provides the most accuracy but typically costs more with its sophisticated equipment and training needs.

There are a wide variety of options to be employed when creating GIS data. Different levels of accuracy and feature attributes can be implemented, and the entire project can be done in phases over time with the more important layers created first. Remember, GIS is a dynamic system—it is designed to grow and be modified over time.

5.9 Using Tree Benefit Models

Arboricultural research and technological advances in computer analysis are allowing municipalities to document the benefits of trees beyond aesthetics and real estate values. Tree benefit models use aerial and satellite imagery and tree inventory data to determine the levels and values of public health and safety and other benefits, such as air pollution reduction, stormwater mitigation, and energy conservation.

These benefit models conduct complex statistical analyses of ecosystem and environmental services that trees provide to a community. The reports and maps created can then be used for land-use planning, policy-making, and urban forestry program evaluation.

The Town of Leesburg used CITYgreen, a tree benefit model, to measure the size and location of the forest canopy within the Town limits. The resulting data provided the Town with tree benefits in terms of stormwater quantity and quality, air pollutant removal, and carbon sequestration and storage. The combined values of the forests remaining in Leesburg provide a benefit of over $11 million annually.

There are other tree benefit models now available for municipalities to use—the Urban Forestry Effects Model (UFORE) and the Street Tree Resource Analysis Tool for Urban Forest Managers (STRATUM). These models were developed by the U. S. Forest Service, and are now part of the i-Tree suite of urban forest management tools. These models have been extensively peer-reviewed for accuracy, and are available for the Town to use.

The i-Tree suite of software tools help communities to identify and manage the structure, function, and value of urban tree populations. Together, the suite provides a scientifically sound system for data collection, analysis, and quantification of the benefits and costs of urban forest management.

5.9.1 UFORE

UFORE is a computer model that calculates the structure, environmental effects, and values of the entire urban forest. The model is designed to use standardized field data from randomly located plots or complete inventories. UFORE results are compatible with ArcView for display in GIS systems.

The UFORE model is currently designed to provide accurate estimates of:

- Urban forest structure (*e.g.*, species composition, number of trees, tree density, and tree health), analyzed by land-use type.
- Pollution removed by the urban forest, and associated percent air quality improvement throughout a year. Pollution removal is calculated for ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter (<10 microns).
- Volatile organic compound emissions and the relative impact of tree species on net ozone and carbon monoxide formation throughout the year.
- Total carbon stored and net carbon annually sequestered by the urban forest.
- Effects of trees on building energy use and consequent effects on carbon dioxide emissions from power plants.
- Compensatory value of the forest, as well as the value of air pollution removal and carbon storage and sequestration.
- Tree pollen allergenicity index.
- Potential impact of pests, such as gypsy moth, emerald ash borer, or Asian longhorned beetle.

The UFORE software is in the public domain and available at no cost to all interested individuals and organizations through i-Tree. If the Town wants to consider conducting its own UFORE project, be aware that the program requires specific types and amounts of data to accurately project the structure and benefits of urban vegetation. The validity of results from UFORE will depend on a large degree to how closely the Town adheres to project setup and sampling protocols. More information can be found at www.itreetools.org.

5.9.2 STRATUM

STRATUM is a street tree management and analysis tool for urban forest managers that utilizes simple tree inventory data to quantify the value of annual environmental and other benefits such as: energy conservation, air quality improvement, carbon dioxide reduction, stormwater control, and property value increases. Uniquely, this model also considers management, maintenance, and planting costs, and can, therefore, produce data on costs-benefits and management needs.

Using simple, non-GIS based tree attribute data from sample plots to complete inventories and community specific information (*e.g.*, program management costs, population, and price of residential electricity), STRATUM applies tree growth and benefits models to calculate:

- Structure (*i.e.*, species composition, extent, and diversity).
- Function (*i.e.*, the environmental and aesthetic benefits trees afford the community).
- Value (*i.e.*, the annual monetary value of the benefits provided and costs accrued).
- Management needs (*i.e.*, evaluations of diversity, canopy cover, planting, pruning, and removal needs).

STRATUM produces a report consisting of graphs, charts, and tables that managers can use to justify funding, create program enthusiasm and investment, and promote sound decision-making. In short, STRATUM can assist managers and communities answer the question whether the benefits of street trees outweigh their management costs.

STRATUM differs from other urban forest analysis and tree benefit software models in many ways:

- STRATUM is designed for analyzing street tree populations, not the entire urban forest.
- It is intended to be utilized as a planning tool, going beyond the reporting of benefits.
- Costs of management, rather than benefits alone, are incorporated to provide a platform for strategic planning.
- STRATUM is not GIS-based; it requires only basic inventory data.

STRATUM also is in the public domain and is available at no cost to communities.

5.9.3 Summary of Tree Benefit Models

Both UFORE and STRATUM are benefit models that could assist Leesburg in supporting the growth of the urban forestry program, and aid the Town in making the right management decisions at the right time. Since the CITYgreen analysis was based on 2001 data, the Town should consider using UFORE in the next several years to requantify the location, extent, and benefits of the entire urban forest. The availability of STRATUM is also further justification for the Town to perform a citywide tree inventory to document the value of street trees and justify management costs.

6.0 Urban Forestry Management Recommendations

6.1 Risk Tree Management

Situations where injury or property damage has occurred from falling trees are not isolated and are well documented in the media on a regular basis. Along with the potential for personal injury or property damage comes the probability of the responsible parties being held liable for any injuries or damages. Such lawsuits can and have resulted in costly judgments against the defendants.

Criteria of Safety Risk Trees

- *A defective tree, or tree part, that poses a high risk of failure or fracture*
- *Presence of a target that could be struck by the tree (*e.g.*, people or property)*
- *Environmental hazards may increase the likelihood of tree failure (*e.g.*, severe storms, strong winds, shallow or wet soils, or growing spaces that restrict root or crown development)*

Public safety must be the primary concern in Leesburg. Tree removals and pruning are a vital part of safety risk mitigation. The general tree population in the Town is in good to fair condition; however, there are large trees with varying degrees of risk factors existing in the scaffold limbs, trunks, and roots. Consideration must always be made of area usage and the threat of falling limbs or trees to persons and property when putting a pruning and removal plan into action.

External indicators of increased risk trees, such as obvious root zone activity, decay fungi, or included bark, require special attention to meet the public's safety needs. Trees that display decay fungi or obvious signs of wood decay should be carefully monitored and evaluated for safety concerns and risk management. Trees with poor structure, such as those with codominant leaders or multiple trunks, can pose a greater failure risk than trees with good structure. All Town trees (especially trees in the large-size diameter class) with signs of decay and/or poor structure should be examined annually for signs of impending failure.

6.1.1 Priority Tree Maintenance Recommendations

The following tree risk management and maintenance recommendations are based on the analysis of the inventoried portion of Leesburg's urban tree population. These recommendations should be followed and used in the development of appropriate and realistic management goals. Implementation of these recommendations will allow Leesburg to first address the highest priority maintenance recommendations related to public safety.

Initially, Leesburg should concentrate on reducing the potential risks identified in the inventory. This means removing all trees identified as recommended for Removal 1 and Removal 2 and pruning all trees requiring Prune 1 and Prune 2 (Tables 4 and 5). Three levels of service for priority tree maintenance recommendations are presented in Table 6.

Table 4. Priority Tree Maintenance Recommendations by Type and Size Class: Street Trees

Tree Diameter Size Class (Inches)	Removal 1	Removal 2	Prune 1	Prune 2
1 – 3	0	11	0	0
4 – 6	1	0	0	1
7 – 12	4	2	0	10
13 – 18	0	1	1	15
19 – 24	3	0	3	7
25 – 30	1	0	1	2
31 – 36	0	0	2	3
37 – 42	0	0	0	1
43+	0	0	1	2
Totals	**9**	**14**	**8**	**41**

Table 5. Priority Tree Maintenance Recommendations by Type and Size Class: Public Space Trees

Tree Diameter Size Class (Inches)	Removal 1	Removal 2	Prune 1	Prune 2
1 – 3	0	16	0	0
4 – 6	0	4	0	1
7 – 12	1	3	1	12
13 – 18	5	0	1	10
19 – 24	4	0	1	6
25 – 30	0	0	1	7
31 – 36	0	0	1	0
37 – 42	1	0	0	2
43+	0	0	0	1
Totals	**11**	**23**	**5**	**39**

Table 6. Priority Tree Maintenance Program Levels of Service

Levels of Service	High	Medium	Low
Street Trees	$10,835	$5,417	$3,611
	72 trees	36 trees annually	24 trees annually
	Accomplish priority tree removals and prunes in 1 year	Accomplish priority tree removals and prunes in 2 years	Accomplish priority tree removals and prunes in 3 years
Public Space Trees	$11,165	$5,869	$3,913
	78 trees	39 trees annually	26 trees annually
	Accomplish priority tree removals and prunes in 1 year	Accomplish priority tree removals and prunes in 2 years	Accomplish priority tree removals and prunes in 3 years

6.1.2 Useful Life

The useful life of a public tree ends when the cost of maintenance is greater than the value added by the tree to the community. This can be due to either the decline of the tree's condition and increasing maintenance activities or to the costs of repairing damage caused by the tree's presence.

Decline generally starts when the tree has reached a point where it cannot withstand the stresses imposed by its environment. Restrictive growing space, disease, insects, mechanical injury, pollution, and vandalism, among others, can cause stress. Although some species are more resistant to these urban stresses, all trees in urban settings will eventually decline, whether due to maturity, stress, or senescence.

The pattern of decline generally begins with persistent limiting site factors that place the tree in a state of chronic stress. This weakens the tree's natural defenses, leaving it more susceptible to injury from pests or unusual weather, such as a single insect induced defoliation or a late frost. When a tree is stressed, it has difficulty withstanding or combating the circumstance or recovering from such stress. As a result, the tree can become even more vulnerable to insects and disease that continue to reduce its vigor. Often, the first signs of a problem appear at this point.

The age at which a tree reaches the end of its useful life differs by genus and species. Slow-growing trees, such as northern red oak (*Quercus rubra*), are most valuable when they attain maturity. Fast-growing species, such as green ash, are most valuable as juvenile trees, because they provide benefits quickly and become expensive to maintain as they reach maturity.

The end of a tree's useful life can also be reached while the tree is still healthy if it is growing in a limited site. Useful life, in this instance, is the point at which the cost of related maintenance, such as the repair of hardscape damage, exceeds the value added by the tree. For example, a large, fast-growing tree used in a smaller tree lawn will cause hardscape damage at an early age and periodically throughout its lifetime. The useful life of this tree will be reached before it begins to decline. A smaller tree, on the other hand, would probably not exceed grow space dimensions at any point in its life. The end of its useful life would probably be reached only when it started to decline due to senescence. A smaller tree, as a result, would make better use of this example tree site.

6.1.3 Priority Tree Maintenance Summary

The following priority tree maintenance recommendations are based on the collected tree inventory data. Where numerous priority removal and/or pruning treatment recommendations exist in the same area of Leesburg, the work should be performed at the same time in order to reduce travel time and costs.

The Town should also establish procedures for keeping the tree inventory information current. Keeping accurate records of work completed on specific trees and tracking tree condition will help accomplish this. With a renewed commitment to updating the tree inventory, Leesburg's database will prove to be a valuable tool in organizing, scheduling, and routing the work that needs to be accomplished.

As mentioned earlier, the overall maintenance priorities are Priority 1 and Priority 2 Removals and Pruning. Although large, short-term expenditures are required for trees with these maintenance recommendations, they should be performed within the first two years of implementing this management plan.

Following completion of these tasks, the Large/Small Routine Prune work should be addressed, including all stump removals. Much of the priority maintenance work identified in the inventory can be attributed to years of deferred routine maintenance. Based on the tree inventory's results, Tables 7 and 8 provide a summary of priority maintenance recommendations for Leesburg's street and public space trees. Table 9 presents three levels of service for these recommendations.

Table 7. Routine Pruning Recommendations by Size Class: Street Trees

Diameter Size Class (Inches)	Large/Small Routine Prune (Total Trees)
1 – 3	322
4 – 6	95
7 – 12	303
13 – 18	89
19 – 24	24
25 – 30	3
31 – 36	12
37 – 42	1
43+	1
Totals	**850**

Table 8. Routine Pruning Recommendations by Size Class: Public Space Trees

Diameter Size Class (Inches)	Large/Small Routine Prune (Total Trees)
1 – 3	385
4 – 6	265
7 – 12	389
13 – 18	129
19 – 24	26
25 – 30	12
31 – 36	1
37 – 42	2
43+	3
Totals	**1,212**

Table 9. Routine Pruning Program Levels of Service

	Levels of Service		
	High	**Medium**	**Low**
Street Trees	$8,345	$5,840	$4,525
	170 trees annually	121 trees annually	95 trees annually
	5-year pruning cycle	7-year pruning cycle	9-year pruning cycle
Public Space Trees	$11,015	$7,865	$5,955
	242 trees annually	173 trees annually	133 trees annually
	5-year pruning cycle	7-year pruning cycle	9-year pruning cycle

Davey Resource Group strongly encourages the Town to schedule all priority maintenance recommendations to occur in a timely manner to reduce potential safety risks. By doing so, the Town will greatly lessen the potential of injury to citizens, damage to property, and possible liability litigation. Although it would be impossible to expect the Town to perform all needed maintenance activities immediately, an organized and systematic program will achieve the needed results in a timely manner and will demonstrate the Town's sincere attempt to keep all of its streets and public spaces safe for its citizens.

To reduce the hazards in Leesburg, the work in Tables 4 and 5 should be accomplished during the next two years. In addition to these immediate concerns, national averages indicate that a natural mortality rate of 1% of the street and public space tree populations in cities annually should be expected. The mortality rate for Leesburg's public trees could represent approximately 28 trees per year. Leesburg's public tree population is relatively young; however, it is important to note that as the current tree population ages and matures in the next 25 years or so, the Town should anticipate a gradual increase in this annual death rate.

The management of trees on streets, parks, and other public settings can be challenging. Some tree failures can be predicted and some cannot. Although not all hazard trees can be detected, corrected, or eliminated at any given time, having trained personnel perform regular safety risk tree assessments and property inspections can help make public rights-of-way and public property reasonably safe while preserving the aesthetics and other benefits trees provide.

6.2 Mature Tree Care

The benefits and values of trees are maximized when trees reach maturity and become established in their growing location. To maintain this high level of benefits for a longer period, the Town should commit to providing regular scheduled maintenance to its mature trees and prepare for non-routine arboricultural treatments as needed.

A comprehensive mature tree care program primarily centers on routine, or preventive pruning, and the ability to provide fertilization, irrigation, insect and disease control, and cabling and bracing when necessary.

6.2.1 Routine Pruning Program

Routine Pruning should occur on a cyclical basis for the entire tree population once all priority maintenance removal and pruning activities have been completed. Since the priority maintenance recommendations described above may be accomplished in the first two years, it is recommended that the routine pruning program described here be implemented beginning in the same years if funds exist for the work. If funds do not exist, the routine pruning program can begin after the priority tasks have been completed. This activity is extremely beneficial for the overall health and longevity of street and public space trees. Through routine pruning, potentially serious problems can be avoided because the trees can be closely inspected during these pruning cycles. Proper decisions can be made on declining trees, and any trees that become potential hazards can be managed appropriately before any serious incidents occur.

Small trees currently constitute a considerable portion (59%) of Leesburg's street and public space tree population. The Town's forestry personnel must recognize that as these small trees reach maturity, more work will be required to maintain a five-year pruning cycle. The Town should develop an organized, documented approach to cyclical tree maintenance that can be easily managed by Town staff and properly trained volunteers, if budgetary issues are a concern.

Routine Pruning

Pruning of young and newly planted trees will be addressed in Chapter 6.3.1, Training Pruning Program. *However, as young trees in this group grow larger, they, too, will eventually become part of the routine pruning program.*

6.2.2 Small Growth-Habit Trees

Small Routine Pruning is recommended for mature, small growth habit trees, such as the flowering crabapples, callery pears, and flowering dogwoods in the Town of Leesburg. These species are genetically small trees and usually attain a maximum height no greater than 25 to 30 feet, but like all urban trees, they require periodic pruning throughout their life span. The primary reason to periodically prune these small growth-habit species is to maintain overall health and vigor through the removal of dead, dying, or diseased branches, as well as branches that may be interfering with the growth of other major branches. By maintaining these trees through periodic small routine pruning, the potential for decay can be minimized and their vigor can be improved by retaining only strong, healthy branches.

Since approximately 59% of the Town's tree population is composed of young trees 6 inches and less in diameter, and 1,221 (44%) trees are recommended for small routine pruning, this activity would greatly benefit the overall health and quality of Leesburg's urban forest.

Small routine pruning can normally be accomplished from the ground with relatively inexpensive equipment. For this reason, it is recommended that the Town organize a small tree care crew that would be able to easily perform this work with existing equipment. It has been Davey Resource Group's experience that, based on the generally small size of the trees in this category, a crew of two properly trained personnel would be capable of accomplishing the work.

This crew would be responsible for the cyclical trimming of all mature, young trees, as well as the training pruning of young and recently planted trees. Additionally, they can perform clearance-trimming work. This is known as crown raising (elevating of tree limbs), and it will allow vehicles to safely pass on streets or pedestrians to walk on sidewalks. Furthermore, the clearing of limbs away from signs and traffic signals can also be accomplished.

There are also many young spruces and pines in Leesburg. These trees normally require little in the way of training pruning, but inspections should be made to ensure that each tree does not have more than one leader or trunk. Occasionally, pines and spruces will develop codominant leaders that, if not pruned to a single leader, result in a tree with poor structure. Other problems may include the likelihood of creating traffic clearance problems and increased susceptibility to storm damage.

6.2.3 Five-Year Cycle

Trees recommended in the inventory for Large Routine Pruning and Small Routine Pruning should be organized into a five-year cyclical pruning program. Results from the tree inventory indicate that about 850 street trees (84.9%) and 1,212 public space trees (67.9%) would be included in a cyclical pruning operation. Additionally, 49 (4.9%) street trees and 44 (2.5%) public space trees were recommended for some type of priority pruning. Once the priority pruning recommendations of these trees are met, they, too, will fall into the maintenance category of routine pruning. This will increase the total number of mature trees requiring routine pruning to 2,155 (77.3%).

Tables 7 and 8 detail the average numbers of trees in each diameter class that would be pruned annually during the five-year cyclical routine pruning program for street and public space trees (note that trees with priority type maintenance recommendations are not included in this table). Trees requiring Training Pruning are recommended for a three-year cycle and are discussed later in this chapter.

It is suggested that a five-year cycle be implemented so that 170 street trees and 242 public space trees are routinely pruned annually. As happens all too often in many cities, tree pruning consists of trimming by resident request or only if a hazardous situation exists. This management plan provides the Town with exact numbers concerning routine pruning, and it only serves as a guideline for accomplishing such a program.

Routine pruning includes those trees requiring pruning on a cyclical basis to maintain tree form and health. Centralized pruning should be carried out, meaning that all trees in a Town block are trimmed. A certain number of Town streets (and blocks along those streets) and public spaces should be designated for each year's work in order to meet the annual routine pruning goal.

6.2.4 Fertilization

Mature trees should not be placed on a scheduled fertilization program without a documented need. If soil analyses show a distinct and serious nutrient deficiency, or if the tree's root system or growing area has been damaged or contaminated, then the time and expense of fertilization may be worthwhile to save the tree.

The Urban Forester or a Certified Arborist can use their expertise to determine if and when public trees need fertilization and the appropriate fertilizer formulation and delivery method.

6.2.5 Irrigation

All trees need supplemental watering when there are drought conditions. Under drought conditions, the Town, volunteers, and/or the abutting property owner would accomplish watering mature and young trees.

This supplemental irrigation can be accomplished for park and street trees with a water truck and hose and/or deep root watering lance, or with watering aids, such as the widely used Treegator® Drip Irrigation Bags. Citizens and abutting business owners should be encouraged to water street trees frequently during the summer, even when there are no drought conditions.

When trees are planted in tree wells, or are growing in restricted rooting areas, such as between streets and sidewalks, they are rarely receiving enough water from natural rainfall. Additionally, if a tree's roots system has been compromised or damaged by a construction project or accident, whether drought conditions are present or not, supplemental watering during the growing season may be a critical factor in the tree's long-term survival.

6.2.6 Insect and Disease Control

Generally, mature trees do not have significant insect and disease problems if they are healthy and well-cared for. Some degree of insect infestation and disease incidence will always be present, as this is the norm for the natural world.

However, trees in street and other highly urbanized settings can be predisposed to insect and disease problems since they are growing in unnatural and constrained environments. Therefore, it is prudent to include insect and disease monitoring as a routine part of a public tree inspection program. Monitoring will be discussed in more detail in Chapter 6.6, *Future Risk Tree Management*.

It is only when particularly damaging insects, such as gypsy moth and emerald ash borer, are detected, the levels of insect populations are extremely high, or when particularly virulent diseases are diagnosed, that action must be taken. The type and extent of action depends on the type and extent of the insect or disease problem. Biological and synthetic chemical controls are available for most situations. Improved arboricultural knowledge and chemical application technology allows most treatments to be directed into the soil or into the tree, avoiding open, broadcast spraying of the crown, which in a public setting is usually not well-received.

6.2.7 Cabling and Bracing

Primary Uses of Cabling and Bracing

- ***Prevention****—to reduce the chance of failure on a healthy tree with structural weakness (*e.g.*, a specimen oak in good condition but having large limbs with V-crotches).*
- ***Restoration****—to prolong the existence of a damaged tree (*e.g.*, a large sugar maple that lost one of its leaders in a storm, leaving the others suddenly exposed and vulnerable to further damage).*
- ***Mitigation****—to reduce the hazard potential of a tree (*e.g.*, a picturesque multi-stemmed hickory that towers over a picnic shelter).*

Rather than remove or severely prune a mature tree if a structural defect is discovered, the use of structural support can reduce safety risks. Cabling and bracing are the two most common forms of structural support for trees. Other, less common forms of structural support are guying and propping. Structural support is infrequently recommended, but trees with special or historic significance can be spared from removal by using such techniques as cabling and bracing. Generally, this involves installing flexible cables or rigid rods to reduce the chances of failure of defective unions.

If the decision is made that a tree needs structural support, there are a few basic considerations. First, only use a Certified Arborist who is knowledgeable and experienced in this area. Ask about the important technical aspects of correct cabling and bracing: the strength and material of the hardware; the arrangement of the cables (*e.g.*, simple, triangle, or box) or rods (*e.g.*, single or multiple); and the location, type and size of the entries made into the tree. Be sure to specify in writing that "all work and materials shall be in accordance with ANSI, A300 Tree Care Standards (Part 3), 2005."

6.3 Young Tree Care

The most significant population of Leesburg's inventoried public trees are newly planted or young trees. With the new policy that allows planting on the public right-of-way, more new trees will be added to the Town's urban forest.

It is critical then to understand the proper maintenance techniques required to ensure the longest and safest service life of these trees. The major components of a young tree care program are pruning, mulching, and watering.

6.3.1 Training Pruning Program

Training Pruning consists of the removal of dead, dying, diseased, interfering, conflicting, and/or weak branches, as well as selective trimming to direct future branch growth on trees less than 20 feet in height. Although this type of pruning is termed training pruning, the word training truly pertains to young or recently planted trees. For these trees, training pruning is used to develop a strong structural architecture of branches so that future growth will lead to a healthy, structurally sound tree. Many young trees may have branch structure that can lead to potential problems as they grow, such as double leaders, many limbs attaching at the same point on the trunk, or crossing/interfering limbs. When trees are small, these problems can be remedied easily and inexpensively.

Training pruning can be accomplished from the ground with a minimum amount of equipment. If structural problems are not corrected while trees are young, they can lead to instances where branches are poorly attached and where decay can develop at the crossing points of interfering limbs. Trees with poor branching can become safety risks as they grow larger and could create potential liability for Leesburg in the near future.

All newly planted trees should receive their first training pruning within three years following planting. Training pruning should not be done when a tree is planted, because it is already under stress from transplanting and needs as much of its leaf canopy as possible in order to manufacture food and increase root growth for proper establishment in its new site. Only dead or broken branches should be removed at the time of planting, and in the next two years.

6.3.2 Three-Year Maintenance Cycle

Similar to the routine pruning program, the training pruning program would also be accomplished on a cyclical basis, but the work would be scheduled during a three-year cycle rather than the five-year cycle for the routine pruning of larger established trees. As mentioned above, newly planted trees should receive their first training pruning three years after planting. This work can be accomplished throughout the year. Since no bucket truck is required, Town employees can perform this work at any time. This type of work is also highly suitable for properly trained summer interns, part-time employees, and/or volunteers.

6.3.3 Work Estimates

Tables 10 and 11 provide the total training prune needs by diameter size class based Leesburg's tree inventory data. The inventory data did not identify any trees in the 4- to 6-inch or the 7- to 12-inch size classes. A three-year pruning cycle would require the training pruning of 24 street trees and 159 public space trees per year. It has been Davey Resource Group's experience that, based on the generally small size of the trees in this category, a crew of two properly trained personnel would be capable of accomplishing the work.

Table 10. Total Training Pruning Recommendations: Street Trees by Size Class

Size Class (Inches)	Training Prune (Total Trees)
1 – 3	72
4 – 6	0
7 – 12	0
Totals	**72**

Table 11. Total Training Pruning Recommendations: Public Space Trees by Size Class

Size Class (Inches)	Training Prune (Total Trees)
1 – 3	478
4 – 6	0
7 – 12	0
Totals	**478**

Table 12 provides three levels of service for the training pruning program. The levels of service for the street trees is based on the quantity of additional trees that should be planted annually to achieve Leesburg's stocking goals (refer to Chapter 6.4.4, *Tree Planting Process* and Table 13)[1]. Since there is no method or data available to assess varying levels of service for additional plantings in the parks, only one level of service for existing park trees was calculated in Table 12.

Table 12. 3-Year Training Pruning Program Levels of Service

Levels of Service	High	Medium	Low
Street Trees	$13,380	$10,125	$6,870
	892 trees	675 trees	458 trees
	Training pruning on a 3-year cycle	Training pruning on a 3-year cycle	Training pruning on a 3-year cycle
Public Space Trees	$2,385	Not Calculated	Not Calculated
	159 trees		
	Training pruning on a 3-year cycle		

[1] For example, 24 existing trees should be in the training pruning program; 434 newly planted trees (the minimum level of service for tree planting as shown in Table 13) should be included in the annual training pruning program. Therefore, to achieve a low level of service for the 3-year training pruning program, a total of 458 trees should be training pruned annually.

6.3.4 Mulching

Mulching is more than an aesthetic treatment in the landscape. Trees that are properly mulched benefit from less drought stress and less cold damage, and tend to grow faster and be more vigorous. Mulch also helps prevent trunk and root damage from mechanical removal of grass and weeds.

Some public trees in Leesburg were observed to have mechanical damage. These are mainly younger trees with injuries caused by lawn mowing equipment, but there are also mature trees with similar damage. This kind of stress on a tree can make it more susceptible to pest problems by providing access to internal wood tissue. There are certain insect pests specifically drawn to wounded trees, and if a tree is already stressed, the additional injury can substantially reduce the tree's ability to sustain defense and maintenance growth. A less visible impact is the effect on roots; decay from trunk damage can spread into the root system.

It is recommended that all small diameter trees be mulched regularly. Large diameter trees should also be mulched where the mulch bed will not interfere with other uses of the area.

Mulch can consist of a variety of materials, ranging from the more expensive, but aesthetically pleasing, shredded black hardwood bark, to no-cost rough wood chips. Either type is acceptable and provide the many benefits of mulch.

Generally speaking, mulch is applied in a 2- to 4-inch layer in a 3-foot diameter circle around young trees and as far out as the dripline in mature trees. Mulch is placed in a saucer shape around the tree, meaning the outside edges are slightly higher than the inside, and mulch is never placed directly against the trunk. Mulch is also usually applied once a year, as long as the 2- to 4-inch depth is not exceeded.

Chemical herbicides used in conjunction with mulch is the most effective way of keeping unwanted grass and weeds from growing in the mulched area and near the tree. Many safe, non-restricted post-emergent sprays, like Round-Up®, are available to kill weeds. Effective pre-emergent sprays, like Preen®, are available to prevent weeds from ever germinating. When these types of herbicides are used in combination with mulch, public trees will derive the benefits from mulch, avoid mechanical damage, and be more attractive.

6.3.5 Watering

This maintenance task was discussed previously, but it is even more critical to water young trees during the first few years after planting as part of their routine care program.

This task can be performed by Town staff or contractors, but is one that is easily accomplished by volunteers and citizens. For example, the use of watering aids, such as the widely used Treegator® Drip Irrigation Bags, waterhoses, and nearby homeowners willing to share their water, will allow volunteers and youth organizations to irrigate several blocks of newly planted trees in a single day.

6.3.6 Training of Personnel

Proper training in pruning young tree structural pruning would be required for Town personnel responsible for this task. Additionally, these workers would require an understanding of the growth-habits of the various species being planted, as well as an understanding of tree anatomy and physiology. This training can be received through several sources, including the Town's urban forester, local urban forestry consultants, and/or International Society of Arboriculture Certified Arborists. The tremendous aesthetic and financial benefits to be gained in the years to come from proper pruning of young trees are a strong incentive for educating tree crew personnel concerning proper pruning techniques. The added knowledge gained by the individuals could augment the sense of professionalism in their jobs.

6.4 Tree Planting

Considering the ongoing and aggressive land development and Leesburg's goal to increase canopy cover, tree planting should be a major goal for the Town. Not considering private property, the streets, parks, and other public areas offer ample opportunities for new tree planting. Therefore, it is important to make sure this goal is carried out in the most effective way possible. The trees planted now will have a great impact on the Town's future character and livability.

6.4.1 Developing an Effective Tree Planting Program

Tree species and planting location designations are significant components of a municipal tree care program because of the long-term impact of these decisions. It is important to develop an overall planting strategy, initially concentrating on streets and blocks with the greatest need for improvement.

The success of a continuing tree planting program will be judged by the post-planting health of the trees and the amount of money spent on planting and maintaining the new trees. With a small amount of planning, healthy trees with greater life expectancies can be established with minimal initial investment and minor maintenance costs.

The key elements for a successful tree-planting program are covered in this section and are primarily based on the exceptional reference *Principles and Practice of Planting Trees and Shrubs* (Watson and Himelick, 1997).

6.4.2 Tree Species Diversity

Tree plantings in historic districts and new developments add greatly to the aesthetic appeal of the Town. However, species diversity in new plantings should be a primary concern. The dangers (*e.g.*, disease and insects) of planting monocultures have proven to be devastating throughout the eastern and midwestern United States. The goal should be to maintain species diversity throughout the Town such that no more than one species represents 10% and that no one genus comprises more than 20% of the total population.

6.4.3 Tree Species Selection

Leesburg is located in Zone 7 of the USDA Hardiness Zone Map, which identifies the climatic region where the average annual minimum temperature is between 0 and 10 degrees Fahrenheit. Tree species selected for planting in the Town should be appropriate for this zone. In addition, species should be urban-tolerant, and rated as relatively free from insect pests and disease.

In addition to considering site characteristics, such as availability of space, soil pH, and irrigation, species-specific features must also be scrutinized. A major consideration for street trees is the amount of litter dropped by mature trees. Species, such as willow (*Salix* spp.), have weak wood and typically drop many small branches during a growing season. Others, such as American sweetgum (*Liquidambar styraciflua*), drop high volumes of syncarps (fruits). In certain species, such as ginkgo (*Ginkgo biloba*) and osage-orange (*Maclura pomifera*), female trees produce offensive/large fruit; male trees, however, produce no fruit. Furthermore, a few species of trees, including black locust (*Robinia pseudoacacia*), hawthorn (*Crataegus* spp.), and honeylocust (*Gleditsia triacanthos*), may have substantial thorns. These species should be avoided in high traffic areas.

Seasonal color should also be considered when planning tree plantings. Flowering varieties are particularly welcome in the spring, and deciduous trees that display bright colors in autumn can add a great deal of interest to surrounding landscapes.

Above all, tree species should be selected for their durability and low-maintenance characteristics. These attributes are highly dependent on site characteristics as well as species characteristics. Matching a species to its favored climatic and soil conditions is the most important task when planning for a low-maintenance landscape. Plants that are well matched to their environmental and site conditions are more likely to resist pathogens and insect pests, therefore, requiring less maintenance overall. Refer to Appendix G for additional tree species and cultivars suitable for planting in Leesburg.

6.4.4 Tree Planting Process

As trees are purchased through local nurseries, the most important consideration should be species selection to increase species diversity throughout Leesburg. Calculations show that 8,681 vacant planting sites exist along the Town streets that are suitable for new trees. A discussion of how this number was estimated is included in Chapter 5.6, *Planting Vacant Sites*. By setting a goal of filling all of these sites, the Town will be headed toward full stocking of its street tree population. Table 13 represents the costs associated with a planting program designed to fill all current vacant sites, in addition to future vacant sites that become available as trees are removed, over a course of ten years. The many benefits associated with the trees in Leesburg can then be maximized.

Table 13. Tree Planting Levels of Service

	Levels of Service		
	High	**Medium**	**Low**
Street Trees	$190,960	$143,220	$95,480
	868 trees	651 trees	434
	Annual plantings to reach full stocking in 10 years	Annual plantings to reach full stocking in 13 years	Annual plantings to reach full stocking in 20 years

Once the appropriate trees have been selected for planting, the most important detail to ensure success is the preparation of the planting sites. Appendix H explains the proper method of excavating a planting hole. In general, the tree-planting holes should be relatively shallow (typically slightly less deep than the height of the root ball) and quite wide (three times the diameter of the root ball). Care should be taken so that the root collars of the new trees are at the same level or slightly higher than the surrounding soil grade.

In most situations, it is not recommended to add soil amendments to the planting holes, as this can lead to differences between texture and structure of soils inside the planting holes and the surrounding soil. Such differences can lead to either water being wicked away from or accumulating in the planting holes. However, the use of the Town's recycled Tuscarora Landscaper's Choice product would be acceptable and likely very effective.

Tree staking hardware should only be installed when necessary to keep trees from leaning (*e.g.,* windy sites) or to prevent damage from pedestrians and/or vandals. Stakes should only be attached to trees with a loose, flexible material, and all staking material must be removed within one growing season (Appendix H).

6.4.5 Tree Mulching

Mulch should be applied to the surface of the soil around each newly planted tree. Mulch should never be piled up around the root collar (creating mulch volcanoes), but rather should be pulled away from the root collar. Mulch that buries the root collar provides shelter for insects, fungi, and mammals that could damage the tree. Mulch should be applied to an area three times the diameter of the root ball to a depth of two to four inches. Mulch not only suppresses competition from grass and weeds, but also provides a zone where turf maintenance is not needed, thereby keeping lawn mowers and string trimmers safely away and thus preventing mechanical damage. Mulch also helps to hold moisture in the surface of the soil where most of the feeder roots are to be established.

6.4.6 Tree Fertilization

Any fertilization process should not be thought of as feeding or energizing the trees; instead, arboricultural fertilizers should be understood as essentially replacing soil elements or minerals that are lacking or in short supply for a variety of reasons. Nutrients may be in adequate supply but be unavailable for uptake by the trees because of extreme pH conditions. Application of fertilizer may not improve the situation until measures are taken to alter pH levels or to replace the trees with a species better suited for the existing soil conditions.

Fertilization may not be necessary for the first growing season unless specific nutrient deficiencies exist. At the beginning of the second growing season, fertilizers can be applied to the root zone. Nitrogen is usually the limiting nutrient for plant growth. Soil analysis, particularly when combined with a foliar analysis, can determine when other elements are in short supply. Slow-release fertilizers applied in autumn will help root growth and will still be available the following spring.

6.4.7 Tree Pruning

Assuming that the proper trees have been selected for each site, pruning young trees to improve branch structure is the most effective method of reducing maintenance costs as trees mature. At the time of planting, the only pruning that should be done is the removal of broken or dead branches. In the second growing season, minor pruning can be performed to remove branches with poor attachments. In subsequent years, selective pruning should be performed to achieve the proper spacing of branches. See Appendix H for more information on proper pruning techniques.

6.4.8 Tree Purchases

Tree prices, of course, vary based on the species selected, but many nurseries offer trees of 1.5- to 2.5-inch caliper for $100 to $150. As the Town plants more trees annually, obtaining a good price for quality trees will become more important. Saving money on the cost per tree will allow a greater number of trees to be purchased.

A good working relationship with a local nursery is beneficial, but it is equally important that good prices and wide species availability be considered. It is recommended that Leesburg continue to explore local and regional sources for trees and discuss pricing with the current nursery source. Due to the requirement to work towards species diversity, it may be necessary to use several nurseries as sources for trees.

6.4.9 Master Tree Planting Plans and Designs

Given the ambitious goal of increasing Leesburg's canopy cover, it is imperative that Leesburg develop a *Master Tree Planting Plan.* Public opinion rated this management task as a very high priority.

Such a plan would detail the exact location of every available public tree planting site in Leesburg, provide information of the size and type of the growing space, indicate the presence of utilities, and ultimately assign an appropriate species to that site. With this information collected and analyzed, and entered into the tree inventory database, a logical and citizen-responsive prioritization scheme can be developed to begin tree plantings throughout the Town.

Often, the downtown and other business districts are selected as high priority areas to increase the beauty and attractiveness. Tree selection for business and shopping areas must take into consideration the need for shoppers to view storefronts, as well as the need to provide enough shade for shoppers. Tree canopies should be open, as in thornless honeylocusts (*Gleditsia triacanthos inermis*), and the branching habit must be high enough to allow pedestrians to walk comfortably beneath the trees. Other options are tall, narrow growing (fastigiate) species, such as Fastigiate European hornbeam (*Carpinus betulus 'Fastigiata'*) and many others. These trees can provide beauty, a look of uniformity, and a formal appearance to the shopping district.

Tree plantings in residential areas can be selected to match the existing types of trees growing on each street (*i.e.*, large growth-habit trees or flowering tree species) or can be selected to begin to develop a uniform look for a given street. To create unity, balance, and beauty on a street, it is advantageous to plant the same species or species of similar form and size on both sides of the street, if possible. Keep species diversity in mind when developing any type of tree planting design. Often, in older neighborhoods, one side of the street has utility lines, which precludes the use of large trees.

The primary aesthetic role that street tree plantings can play in a residential neighborhood is to visually link individual homes into a unified scene. It is this unified quality that makes older neighborhoods with large mature trees so attractive in many communities. Either formal or informal planting schemes are appropriate for neighborhood streets. In most instances, medium or large trees, spaced so that their canopies overlap, are desirable. As always, a street tree-planting program must have the objective of species diversity in mind at all times.

Recommendation

1. *Maintain species diversity throughout the Town such that no more than one species represents 10 percent and that no one genus comprises more than 20 percent of the total population*
2. *Wherever possible, plant large growth-habit trees that provide shade, provide the greatest environmental and economic benefits, and that are aesthetically pleasing.*
3. *Develop a* Master Tree Planting Plan *for all streets and public properties.*

6.5 Arboricultural Treatment Schedule and Summary

Table 14 summarizes the major tree maintenance and planting tasks recommended for Leesburg. It is provided to help the Town better organize and schedule the tree maintenance program that has been described in this Section. The success of most tree management tasks, such as planting, pruning, or fertilizing, is dependent upon seasonal temperature and weather conditions. The maintenance tasks described in this plan should be scheduled for and performed during optimal biological periods to sustain vigorous tree health and to ensure the best chance for survival of the Town's street and public space trees.

Additional information and references about urban forest maintenance are found in Appendix M, Sources of Further Information, Appendix N, Contracting Tree Work, and Appendix O, Davey Technical Bulletins.

Table 14. Arboricultural Planning Chart for Tree Management

ACTIVITY/ TREATMENT	YEAR*	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
REMOVALS													
Priority One (Inventory)	1	X	X	X							X	X	X
Priority Two (Inventory)	2	X	X	X							X	X	X
Removals (Anticipated)	4A	X	X	X							X	X	X
Stump Removal	3A	X	X	X							X	X	X
PRUNING													
Priority One	1	X	X	X							X	X	X
Priority Two	2	X	X	X							X	X	X
Routine Pruning (Five-Year Rotation)	3	X	X	X							X	X	X
Training Pruning (Three-Year Rotation)	1A	X	X	X							X	X	X
FERTILIZATION													
Macronutrient (N-P-K; Fair and Poor Condition Trees)	1A			X	X						X	X	
Macronutrient (N-P-K; Excellent and Good Condition Trees)	2			X	X						X	X	
Micronutrient (Fe/Mn Trunk Injection)	N					X	X	X	X				
Micronutrient (Fe/Mn Soil Treatment)	N												
PEST MANAGEMENT													
Scouting	1A				X	X	X	X	X	X			
Pesticide Treatments	N				X	X	X	X	X	X			
Pest Pruning	N												
TREE PLANTING													
Site Assessment	1A												
Ball & Burlap Container	1A			X	X	X				X	X	X	
Bare Root	1A			X	X	X							
Watering (New Trees)	1A			X	X	X	X	X	X	X	X	X	
Cabling and Bracing	4N	X	X	X								X	X
Mulching	1A												
Weed Control	1A			X	X	X							
Watering (Older Trees)	1A							X	X	X	X		
INVENTORY													
Update Field Inventory	3	X	X								X	X	X
Update Computer Database	1A												

Notes:
Shaded areas indicate months where tasks can be completed operationally
* = Year task is recommended to be initiated/completed
A = Continue on an annual basis after task is initiated
N = Implement on an as-needed basis
X = Optimal biological time

6.6 Future Risk Tree Management

6.6.1 Addressing Disease and Insect Monitoring

Urban trees are inherently under stress because of many human-induced factors, primarily limited growing space in non-native, sub-standard soil. Basic elements that influence plant health include sufficient water, light, and a proper balance of nutrients. Too much or too little of any of these environmental conditions may cause plant stress. Insect pests and diseases are opportunists that primarily target stressed trees, making urban trees particularly vulnerable. Sound management practices, a proactive monitoring program, and education are the best tools to help mitigate these potential threats to the health of the urban forest.

The array of disease and insect pests that can threaten the health of forest and urban trees and their treatments are too numerous to completely encompass within the scope of this document. However, a basic discussion on the fundamentals of an Integrated Pest Management Program (IPM), and specifically monitoring, is covered is this section.

Factors Influencing the Success of a Disease and Insect Monitoring Program

- *Public education and communication*
- *Cooperation, and support from state and local agencies*
- *Structured system to report, investigate, and diagnose suspected threats*

Fundamentals of an IPM:

1. **Identification:** The proper identification of trees and their existing and potentially harmful pests is necessary to successfully manage a pest outbreak or occurrence. Additionally, understanding each pest's life cycle is important for a positive diagnosis. Knowledge of beneficial and incidental (non-threatening) organisms also plays an important role in the identification and diagnostic process.
2. **Monitoring:** Proactive, regular monitoring for potential threats is perhaps the most important part of an IPM program. Monitoring for pest activity can be done using a variety of techniques, including visual inspection, and, in some cases, use of specialized traps. Regular contact with state and local plant health care officials can help to focus monitoring efforts and increase awareness of emerging threats. In most cases, Virginia's State Forester, university extension services, State Department of Agriculture, or U.S. Department of Agriculture's state office can provide support for suspicions of potential pest infestations.
3. **Understanding the Economic Threshold Level:** The economic threshold is the level in which the costs involved in managing a pest infestation overshadow the value that a tree or plant is providing. In an urban situation, the economic value of a tree can be tied to the benefits that a tree provides. These benefits include, but are not limited to, aesthetic, environmental, and cultural benefits. This concept, on a general level, amounts to determining whether or not a tree is worth the costs of mitigating against a pest problem compared to its value to the community.

4. **Selecting the Correct Treatment:** Once a pest problem has been properly diagnosed and the decision has been made to treat the problem, selection of the correct treatment is the next step. Selecting treatment is a decision that requires a solid understanding of all the options, chemical or otherwise, for pest management material.
5. **Proper Timing of Management Strategies:** Once an appropriate treatment has been selected, it is important to carefully plan the timing and implementation to maximize effectiveness.
6. **Recordkeeping:** To facilitate future pest management decisions, accurate records should be kept concerning information on pests, treatments, locations, timing, weather conditions, and any other useful information.
7. **Evaluation:** A successful IPM must be evaluated based on experience, successes, and failures in order to focus efforts and resources for the future.

A list of the most prominent existing and potential Pest Alerts relevant to Leesburg is included in Appendix I. Further information on each of these pests is provided by the USDA Forest Service (http://www.dof.virginia.gov/resinfo/insects-disease-guide.shtml) and the Virginia Department of Forestry (http://www.na.fs.fed.us/pubs/palerts.shtm).

Existing Pest and Disease Threats

Black Gum Mortality	*Gypsy Moth*
Canker Stain Affects Delaware Sycamores	*Hemlock Borer*
Cherry Scallop Shell Moth	*Hemlock Looper*
Diplodia Tip Blight and Canker of Pines	*Hemlock Woolly Adelgid*
Drought and Winter Drying	*Hickory Mortality*
Dogwood Anthracnose	*Locust Leafminer,* Odonatata dorsalis *(Thunb.)*
Dutch Elm Disease (DED) and the American Elm	*Oak Leaftier and Oak Leafroller*
Eastern Tent Caterpillar	*Oak Tatters*
Elongate Hemlock Scale	*Oak Wilt*
Forest Tent Caterpillar	*Scarlet Oak Sawfly*

Potential Threats

Asian Longhorned Beetle	*Nun Moth*
Emerald Ash Borer	*Periodical Cicada—Brood V*
Common Pine Shoot Beetle	*Sudden Oak Death—Eastern*

6.6.2 Emergency Response

An integral part of urban forest management must include an established procedure for emergency response. Individual tree-related emergencies, such as tree failures and large limb failures, are usually isolated events that can be effectively handled by having an emergency protocol for hazardous trees.

Efficient tree emergency response should proceed in an organized manner to maximize safety and minimize costs. For large-scale storm events that result in substantial amounts of damage and debris from trees, a formal tree emergency protocol should be in place, outlining emergency response steps, safety standards, debris removal plans, public communication means, and contact lists. These steps are outlined in the *Tree Emergency Manual for Public Officials*, included in Appendix J.

Storm events, such as ice storms, high winds, and destructive pest infestations, can result in overwhelming amounts of hazardous trees and debris that have immediate implications to public safety. Storm events often cannot be accurately predicted, and the post-storm management of the resulting hazards and debris can go from challenging to chaotic without an emergency response standard in place. Communities manage such catastrophes with varying degrees of efficiency and often rely on aid from state and federal government agencies to fund hazard reduction and debris removal. That aid depends significantly on the ability to estimate storm damage accurately and quickly. *Storm Damage Assessment for Urban Trees* (Appendix K) introduces a standard method to assess widespread storm damage in a simple, credible, and efficient manner immediately after a severe storm. This assessment method is adaptable to various community types and sizes, and it provides information on the time and funds needed to mitigate storm damage. Paramount to an efficient and accurate damage assessment is the establishment of a pre-storm survey and the training of observers who will be called upon to perform the field assessments as the Town mobilizes after a disaster. The *Storm Damage Assessment for Urban Trees* is an established means to provide reliable results for reporting storm damage; however, any method that will provide efficient and reliable results can be used.

Recommendations

1. *Prepare a tree emergency protocol.*
2. *Establish a method to assess the costs of damage to trees after a storm event.*

6.7 Tree Preservation

The following recommendations are suggestions for action-items to protect and enhance the existing public and private urban forest and to establish new forest cover where it is needed. The recommendations range from a variety of planning and management tools to simple public education. They are suggested as realistic and practical goals for the Town and citizens to achieve.

6.7.1 Legislation

Various types of legislation can be particularly effective in protecting natural resources, since the very nature and location of these resources often cross public and private lines, and the presence or absence of them in a community can greatly affect the community and surrounding area as well.

6.7.2 Tree Preservation Ordinances

Article 12.3, *Twenty-Year Tree Canopy Requirements*, in Leesburg's Zoning Ordinance contains requirements to preserve, replace, and/or plant trees in order to establish a defined minimum canopy cover. Leesburg's current ordinance is a positive step forward; however, it could be improved. A sample tree preservation ordinance is included in Appendix L.

Tree preservation ordinances expand on the general principles and goals of the simple tree ordinances by addressing larger issues, such as protection of trees on private property, protection of trees in critical areas (*e.g.*, streambanks and steep slopes), and protection of unique forest ecosystem areas.

Several approaches can be used to define the preservation of trees within a development. Examples include:

- Using a minimum basal area to ensure a minimum canopy cover for all land within the Town.
- Establishing a maximum percentage of trees that can be lost due to development.
- Requiring that the post-development forest be proportionally similar to the pre-development forest. For example, if 50% of the pre-development forest is mature trees and 50% is saplings, then the post development forest should also consist of 50% mature trees and 50% saplings.

Goals of Tree Preservation Ordinances

- *Reducing tree loss during development*
- *Reducing damage to standing trees during construction*
- *Providing for replacement of trees lost during construction*
- *Planting trees where none occurred previously*
- *Maintaining preserved trees after construction is completed*

Tree replacement guidelines may also be included in the ordinance. For example, some ordinances permit replacing fifteen 2-inch diameter trees for the removal of one 30-inch diameter tree. This can become a complex procedure and may fail to mitigate the loss of a mature forest if there is not a mechanism to ensure the survival of these newly planted trees. In addition, it may be challenging to locate appropriate planting sites for large numbers of small trees.

6.7.3 Riparian Setbacks and Easements

Article 14, *Creek Valley Buffer*, of the Leesburg Zoning Ordinance establishes a mechanism to preserve and protect riparian buffers. In addition, Objective 1 of the *2005 Town Plan* further identifies the Town's desire to protect the riparian corridor. These existing rules support the objectives of this Plan and should be enforced.

Retaining undisturbed, forested land along sensitive resources, such as streams and rivers, provides additional measures of protection. Undisturbed vegetation along streams and rivers filters pollutants, abates flooding, moderates peak flows, allows for groundwater infiltration of stormwater, reduces erosion and sedimentation, stabilizes banks, and provides habitat benefits. These areas may be protected by setbacks from the resource area similar to lot-line setbacks. Setbacks protect property owners by preventing construction too close to flood- or erosion-prone areas that widen due to upstream development.

Requiring riparian setbacks and easements prevents development of the most sensitive lands and promotes a reduction in flooding, erosion, and water quality problems while creating more attractive, livable communities.

6.7.4 Conservation Development

Conventional development carves the landscape into a patchwork of disturbed (*i.e.*, mowed, graded, and paved) land. Conservation development or open space subdivisions are designed to create the same overall density while preserving 50% or more of the site in open space by grouping buildings together on smaller lots than would ordinarily be allowed under standard zoning or by having flexible side, rear, and front yard setbacks. Critical areas of Leesburg's urban forest can be preserved and protected within the open spaces in conservation developments.

Although Leesburg does provide a mechanism for alternative residential developments, such as conservation development in Section 10.3, only three were built in the late 1980s—Westgreen, Foxridge, and Oakview. Objective 3 of the *2005 Town Plan* reinforces the policy of conservation development.

To further promote conservation development, the Town should consider the following:

- Educate local officials and the development community as to the value, public health and safety benefits, and mechanics of conservation development.
- Educate the public as to the benefits of and need for conservation development.
- Identify linked systems of resources to protect the areas for relatively dense development by comprehensive planning.

6.7.5 Conservation Easements and Land Donations

Often, property owners will willingly donate all or portions of their property to governments or non-profit organizations for forest and farmland preservation. Other than the outright donation of property, owners can also allow and approve conservation easements to be placed on their property. A conservation easement is a voluntary agreement that allows a landowner to permanently limit the type and amount of development on their property while retaining private ownership.

All parties concerned in transactions relating to conservation easements and land donations generally regard these actions positively. There is no taking by the government; the community benefits from the additional protected greenspace; and the property owner can receive financial as well as non-financial benefits from the donation or easement transaction. The Town should work cooperatively with local organizations to educate and encourage landowners to consider donating or placing conservation easements on their land to protect critical urban forests.

The *Business Development Strategy for Leesburg, Virginia* recommends creating a 501 (c) (3) non-profit organization to hold land, take donations, and assist with major development projects. Ideally, this local organization would be capable of preparing, accepting, holding, and managing conservation easements and land donations. However, the Town, County, and national organizations, such as The Land Trust and The Nature Conservancy, can also accept donations and easements of forests and open space.

6.7.6 Urban Forest Canopy Inventories

Forest canopy inventories differ from basic tree inventories in that the primary focus is on larger, contiguous tracts of the Town's urban forest rather than on individual trees. This type of inventory is generally prepared using aerial orthophotograph interpretation. A detailed forest cover inventory using high-quality orthophotographs can provide the Town with data on the overall acreage, relative size classes, types (*e.g.*, wooded wetlands) of forested tracts, and high-quality forested areas. The resulting data from an urban forest canopy study can be incorporated into the Town's GIS database.

> ***Inventory Leesburg's Urban Forest Canopy***
>
> *In future urban forest canopy inventories, improved data sources and methodologies should be used to perform the inventory. Manual interpretation of high-quality orthophotographs will provide Leesburg with a more accurate inventory.*

In 2001, American Forests performed an assessment of Leesburg's urban forest canopy cover based on National Land Cover Data from 1992 and 2001. This inventory should be updated at least every five to ten years. Over time, the urban forest canopy inventories will provide the Town with baseline data that can be compared to determine success or failure of protecting and enhancing the urban forest in Leesburg.

6.7.7 Reforestation

A benefit of performing an urban forest canopy inventory as described above is to identify critical areas in Leesburg lacking trees. Areas near floodplains, within riparian corridors, on steep slopes, and over sensitive groundwater areas can be readily located, measured, and ownership determined. Using this information, critical areas needing reforestation can be identified and prioritized. Objective 4 of the Natural Resources Element in the *2005 Town Plan* supports restoring the forest canopy in the developed parts of Leesburg consistent with the planned land use.

Street tree planting, landscaping, reforestation, or riparian restoration projects all require some knowledge of what to plant, where to buy, and how to plant them. A planting plan establishes a program for planning and creating a community that is attractive and is environmentally functional.

It is recommended that potential reforestation areas be located and prioritized. Financial and forestry resources are available from other public agencies and private organizations to implement reforestation projects. To take advantage of these resources, a tree planting plan, or reforestation plan, should be created. The planting plan is necessary to establish a logical schedule to achieve the Town's reforestation goals.

6.7.8 Create a Tree Mitigation Site

Use of a tree mitigation site would be an asset to the Town. A tree mitigation site is a specific piece of land where tree plantings can occur to replace trees that have been removed or damaged due to development elsewhere in the Town. Typically a mitigation site is on publicly owned land or land protected in perpetuity, generally with a conservation easement. The mitigation site would likely be managed by the Town or other entity knowledgeable in forest management, urban forestry issues, and tree care. The party responsible for tree removal or damage funds the purchase, planting, and long-term maintenance of the trees that are planted at the mitigation site property.

6.7.9 Open Space and Greenways Planning

The Leesburg Department of Parks and Recreation adopted the *Leesburg 20-year Parks, Recreation, Opens Space, Trails, and Greenways Master Tree Planting Plan* in October, 2002. The Tree Commission should assist with the implementation strategies and plan priorities developed in the Park Plan to the maximum extent possible. With guidance from the Tree Commission, the efforts to include forested corridors in the implementation of this Plan will be enhanced.

Developing a plan for potential parks and open space resources is important to allow greenways and other open space to be preserved or developed for recreation incrementally as funds become available for land purchase or land is set aside through other means. A greenways plan should use environmental constraints, such as forests, wetlands, and steep slopes, to identify the most important lands to protect, as well as to determine, the type of recreation or open space that should occur there.

It is important to establish linked systems of forests and open space to maximize the multiple benefits of contiguous natural vegetation cover. Trail systems should be linked to provide transportation between community facilities and regional trails. By mapping preferred open spaces, Leesburg, Loudoun County, land conservancies, and even developers, can focus on setting aside or purchasing the lands that provide the most value in terms of resource protection and linked greenways.

6.7.10 Educational Tools

An important element of any successful urban forestry program in any community is education. Governments and non-profits alike can work together to educate and inform property owners on how to maintain their trees and forests, plant trees, and engage in development projects in ways that protect existing forest tracts.

The educational tools discussed in this section are proven approaches to protect urban and community forests. Implementing any of the recommendations previously described will require a substantial effort, and education and information dissemination are critical to the success of these efforts.

Key Principles of a Successful Educational Program

- *Forests and the natural resources within them provide numerous public health and safety benefits, positively affect property values, and increase the quality of life in the Town for both citizens and businesses.*
- *Development can be managed to allow for a variety of uses of property while protecting the most important natural resources.*

Implementing resource protection measures will require educating public officials and developers in designing, implementing, and complying with the new requirements in a way that appropriately protects the resources while allowing use of the land. The measures discussed involve changing perceptions about many issues, including:

1. Natural resources provide public and private health and safety benefits and are natural mechanisms to reduce many problems.
2. Trees and forests are not just attractive areas for people and places for animals to live, they are Leesburg's natural heritage.
3. Natural resources can be protected through both regulation and guidance. Not all forest protection strategies have to be legislated. Incentives and education can greatly promote proper forest stewardship throughout the Town and across Loudoun County.
4. All activities have some level of impact on our natural resources, and Leesburg's residents have a personal responsibility to help protect their resources.

The Tree Commission should take a leadership role in the educational efforts in Leesburg. The Commission, as a non-partisan organization with its access to current and comprehensive forest data, is the natural and neutral agency to affect change.

Education topics should range from the scientific data gathered on Leesburg's urban forest to more basic, consumer-oriented tree care, planting, and benefits information. The educational efforts should be offered to the following persons and groups:

- Town Planners
- Engineers
- Building Inspectors
- Town Advisory Commissions
- Contractors/Subcontractors
- Home/Property Owners
- Homeowner Associations
- Foresters
- Citizen Groups
- Town Council
- Utility Companies
- Realtors
- Developers
- Landscape Architects

Educational tools may include:

- *Workshops and training seminars* with community leaders, advisory groups, contractors, homebuilders, and county and municipal staff.
- *Publications*, including direct mailings, newsletters, forestry and arboricultural handouts, landmark, unique and historic tree brochures, special publications, and articles for the local print media. All publications should be available in electronic format and included on the Town's website.
- *Awards and events* to recognize contractors and governments who excel at tree preservation and reforestation, and a Big Tree Contest and Arbor Day events and programs.

6.7.11 Construction Damage and Tree Preservation

Trees are valuable assets. They clean the air, provide shade and wind protection, add aesthetic benefits, decrease cooling and heating costs, provide pollution control, provide stormwater management benefits, and increase property value.

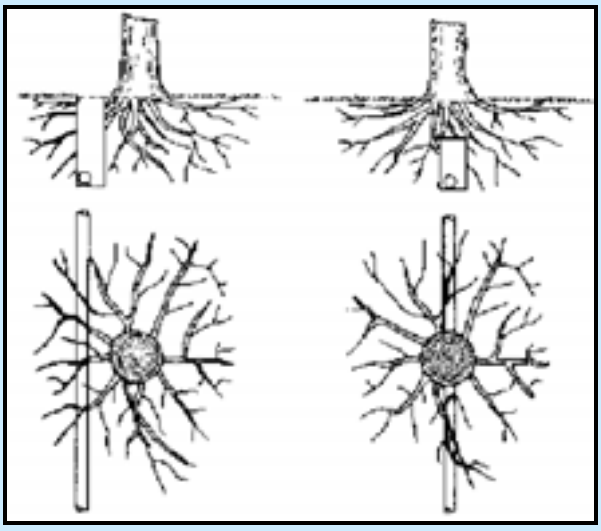
Unfortunately, when expansion occurs in the name of progress, trees are often compromised in the process. Attempts to save trees during the construction process are often doomed unless protective measures are carefully implemented prior to and strictly enforced during construction.

Scientists and arborists agree that the greatest percentage of tree roots are in the upper 12 to 18 inches of soil and extend well beyond the spread of the canopy. It is critical to protect the root zone during construction to preserve a tree.

Trees are adversely affected both above and below ground by construction activities. To preserve trees during construction activities, every possible preservation technique must be implemented to minimize damage. The following information addresses the activities that damage trees during construction—trenching, soil compaction, and soil clearing and grading.

Trenching

A trench dug without consideration can effectively and immediately sever a tree's root system by 50 percent or more. Construction equipment can injure a tree by tearing or breaking limbs and/or roots and by damaging the bark and wounding the trunk. Wounds created from these actions are permanent and can be fatal if extensive.



Tunneling and Directional Boring

Whenever possible, trenching should be restricted to areas that will disturb the least amount of root systems. Where this cannot be achieved because of other site restrictions, tunneling or directional boring should be considered. These practices minimize tree damage by keeping root injury to a minimum.

Soil Compaction

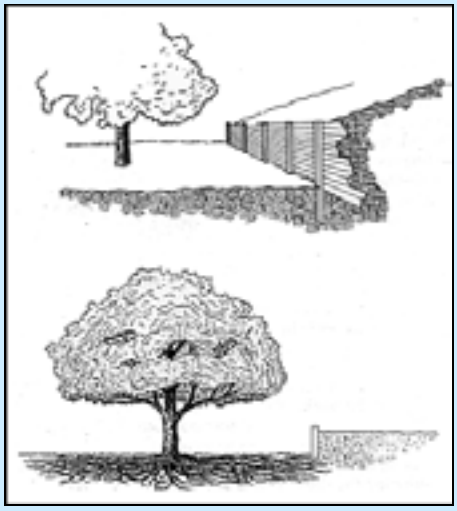
The most damaging effect of construction activity is soil compaction. Species tolerance to compaction varies, but most trees will suffer when the surrounding soil is compacted extensively.

Soil compaction during construction is usually due to equipment and vehicles continually driving over the root zone and from construction supplies and materials being stored for long periods of time near trees. Compaction happens quickly and is difficult, if not impossible, to correct. Only seven passes of a small tractor over the same area is enough to change a porous soil consistency to one similar to concrete.

To remedy this, fencing and off-limits areas should be established. If this cannot be accomplished, then a thick layer of unrefined (coarse) wood chips (12 to 18 inches deep) or sturdy geotextile materials can be temporarily laid over the driving area to reduce compaction.

Soil Clearing and Grading

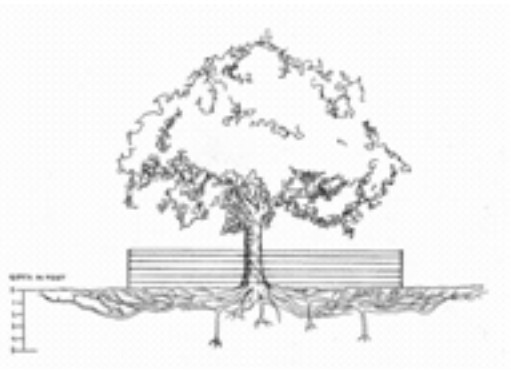
Soil grading and clearing can cause root loss, mechanical damage, soil compaction, and stripping of soil nutrients. These detrimental effects of grading and clearing can be avoided by preserving a tree's root zone. Restricting construction activity in and near the root zone by erecting metal, plastic, or wood fencing is the most effective means of avoiding damage to roots, trunks, and crowns.



Site Design Solutions

Site design solutions are available to achieve required grade changes and to retain trees as depicted in the above illustration. The project architect and/or engineer, working in conjunction with a qualified arborist, can help develop innovative solutions to construction activities and tree preservation.

Ultimately, a Tree Preservation Plan should be developed specifically for all construction projects in the Town that will affect desirable trees and forest tracts. A preservation plan must note that protective tree fencing shall be installed prior to any site work and that it be placed at or outside of the dripline to ensure survivability of existing trees. It must also state that no site disturbing activities (*e.g.*, cut, fill, parking, or material storage) shall take place inside the fenced area. Signs should be posted on the fencing to display all pertinent information, such as potential penalties, Town urban forester contact information, and other useful facts.



During construction, protective fencing should be placed at the critical root zone. A tree's critical root zone can be practically defined as the extent of the dripline despite the fact that a tree's roots often extend two to three times beyond the dripline.

Trees that are only slightly damaged may be restored to a healthy condition by pruning, watering, fertilizing, core aeration, and/or radial trenching. Branches directly interfering with construction work should be properly pruned back. If a tree is severely injured, it should be removed.

While trees that have been disrupted by construction activities may not be showing signs of damage or stress now, they may show signs of decline in the near future. Trees in construction zones can be damaged or killed by root severance, soil compaction, soil grading, and/or construction materials (*e.g.*, toxic leaks and spills).

Tables 15 and 16 list symptoms of construction damage and methods to minimize damage to trees.

Table 15. Symptoms and Signs of Construction Activity Damage

Tree Part	Symptoms and Signs of Damage
Crown	Slow growth rate, staghorns, and/or dieback
Leaves	Wilted, scorched, sparse, undersized, distorted, chlorotic, browning margins, premature autumn color, and/or premature drop
Trunk	Wounds, absent bark, crown rot, absence of buttress (root) flares, adventitious sprouting, suckering, and/or severe insect damage and disease
Branches	Dieback, slow growth rate, wounds, adventitious sprouting, and/or suckering
Fruits and flowers	Abnormally large crop, absence of fruit, and/or flowering out of season

Table 16. Major Construction Impacts and Methods to Minimize Damage

Impact to Tree	Construction Activity	Methods and Treatments to Minimize Damage
Root Loss	Stripping site of organic surface soil during mass grading	Restrict stripping of topsoil around trees. Any woody vegetation slated for removal and adjacent to preserved trees should be cut at ground level and not pulled out by equipment. This will prevent tree root injury.
	Lowering grade, scarifying, preparing subgrade for fills and/or structures	Use retaining walls with discontinuous footings to maintain natural grade as far as possible from trees. Excavate to finish grade by hand and cut exposed roots with a saw to avoid root wrenching and shattering by equipment, or cut with root pruning equipment. Spoil beyond cut face can be removed by equipment sitting outside the dripline of the tree.
	Subgrade preparation for pavement	Use paving materials requiring a minimum amount of excavation (*e.g.*, reinforced concrete instead of asphalt). Design traffic patterns to avoid heavy loads adjacent to trees (*i.e.*, heavy load bearing pavement requires thicker base material and subgrade compaction). Specify minimum subgrade compaction under pavement within dripline (*i.e.*, extra reinforcement in concrete or geotextile under asphalt may be needed).
	Excavation for footings, walls, and/or foundations	Design walls/structures with discontinuous footings/pier foundations. Excavate by hand. Avoid slab foundations/post and beam footings.
	Trenching for utilities and/or drainage	Coordinate utility trench locations with installation contractors. Consolidate utility trenches. Excavate trenches by hand in areas with roots larger than 2 inches in diameter. Tunnel under woody roots rather than cutting them.
Wounding Top of Tree	Injury from equipment	Fence trees to enclose low branches and protect trunk. Report all damage promptly so arborists can treat appropriately.
	Pruning for vertical clearance for buildings, traffic, and/or construction equipment	Prune to minimum height required prior to construction. Consider minimum height requirements of construction equipment and emergency vehicles over roads. An arborist, not construction personnel, should perform all pruning.
Unfavorable Conditions for Root Growth and/or Chronic Stress from Reduced Root Systems	Compacted soils	Fence-off trees to keep traffic and storage out of root area. In areas of engineered fills, specify minimum compaction (usually 85%) if fill will not support a structure. Provide a storage yard and traffic areas for construction activity well away from trees. Protect soil surface from traffic compaction with thick mulch. Following construction, vertical mulch compacted areas. Install aeration vents.
	Spills and/or waste disposal (*e.g.*, paint, oil, fuel)	Post notices on fences prohibiting dumping and disposal of waste around trees. Require immediate cleanup of accidental spills.
	Soil sterilants (herbicides) applied under pavement	Use herbicides safe for use around existing vegetation and follow label directions.
	Impervious pavement over soil surface	Utilize pervious paving materials (*e.g.*, interlocking blocks set on sand). Install aeration vents in impervious paving.

Table 16. Major Construction Impacts and Methods to Minimize Damage (Continued)

Impact to Tree	Construction Activity	Methods and Treatments to Minimize Damage
Inadequate Soil Moisture	Rechannelization of stream flow, redirecting runoff, lowering water table, and/or lowering grade	In some cases, it may be possible to design systems to allow low flows through normal stream alignments and provide bypass into storm drains for peak flow conditions. Usually flood control and engineering specifications are not flexible where the possibility of flooding occurs. Provide supplemental irrigation in similar volumes and seasonal distribution as would normally occur.
Excess Soil Moisture	Underground flow backup, raising water table	Fills placed across drainage courses must have culverts placed at the bottom of the low flow so that water is not backed up before rising to the elevation of the culvert. Study the geotechnical report for groundwater characteristics to see that walls and fills will not intercept underground flow.
	Lack of surface drainage away from tree	Where surface grades are to be modified, make sure that water will flow away from the trunk (*i.e.*, that the trunk is not at the lowest point). If the tree is placed in a well, drainage must be provided from the bottom of the well.
	Compacted soils, irrigation of exotic landscapes	Compacted soils have few macropores and many micropores. Core vent to improve drainage. Some species cannot tolerate frequent irrigation required to maintain lawns, flowers, and other shallow-rooted plants. Avoid landscaping under those trees, or utilize plants that do not require irrigation.
Increased Exposure	Thinning stands, removal of undergrowth	Preserve species that perform poorly in single stands as groups or clusters of trees. Maintain the natural undergrowth.
	Reflected heat from surrounding hard surfaces	Minimize use of hard surfaces around trees. Monitor soil moisture needs where water use is expected to increase.
	Pruning	Avoid severe pruning where previously shaded bark would be exposed to sun. Where pruning is unavoidable, provide protection to bark from sun.

6.7.12 Summary of Tree Preservation Recommendations

Recommendations

1. *Develop and adopt a Tree Preservation Ordinance.*
2. *Enforce riparian setbacks and require riparian easements*
3. *Promote conservation development.*
4. *Promote and establish conservation easements and land donations.*
5. *Perform an urban forest canopy inventory.*
6. *Locate and prioritize potential reforestation areas.*
7. *Create a Tree Mitigation Site.*
8. *Develop an Open Space and Greenways Plan.*
9. *Implement an educational program with the Tree Commission taking the leadership role.*
10. *Require Tree Preservation Plans for all construction projects ion the Town that will affect desirable trees and forest tracts.*

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7.0 Funding Sources

Urban forest management is a recognized function of the Town of Leesburg and receives some dedicated funding. Funding has been allocated for a second full-time, professional urban forester and for various special, contractual projects. Although not dedicated urban forestry budgetary line items, various departmental funds are available and used for emergency tree maintenance, brush removal, landscape design work, and limited tree planting.

However, it appears that the resources available are inadequate to create a comprehensive urban forestry program and accomplish the goals the Tree Commission and citizens of Leesburg desire. With greater funding levels, the Town could move from a reactive to a proactive management approach, provide greater services and increase tree canopy coverage if the security of funds to sustain all activities, programs, and initiatives are available.

There are various funding mechanisms and sources the Town can consider to support increasing staff levels, public education efforts, tree protection, maintenance, planting activities, and other components of a truly progressive, comprehensive urban forest management program.

7.1 Establish a Leesburg Tree Bank

A special account could be created to deposit funds from various sources, which are restricted for use by the urban forestry program. The funds in this account are managed by the Town, subject to the annual budget process, and expenditures follow normal purchasing policies and procedures.

This innovative funding mechanism does not rely on Town general funds but, instead, on the collection and deposit of monies from various sources. Suggested sources included, but are not limited to, the following:

Damage Compensation. This source may not generate a great deal of money, but it is a legitimate and often under-pursued source of funds. When an automobile damages a public tree or when construction equipment destroys a group of public trees, the Town should seek compensation for the landscape value of that tree(s). The Town can rightly seek compensation for the total damages, including: the value of the tree(s); the cost of repair or clean-up; and the cost of the administrative time used during the resolution of the situation. The receipt of $500 from a minor car accident to $5,000 for a major damage claim can add up over time. Generally, the compensation is collected from the insurance company of the person responsible for the damage or directly from the business that caused the damage to public trees. The compensation funds can be used to remedy the specific damage, or be used for other legitimate urban forestry functions throughout the Town.

Permit and Plan Review and Inspection Fees (to the extent permitted under Virginia Code). It is not uncommon for municipalities to require private developers and businesses to support the administrative time needed for proper and professional plan review and site inspection tasks. In light of the Town's goal to protect and enhance the urban forest, charging specifically for the time and arboricultural expertise needed to approve permit applications, review plans, and make site inspections might be a viable option to support the salary and benefits of additional full- or part-time urban forestry positions. The Town may need to perform a job analysis to determine the time spent performing review and inspection tasks, and could investigate what other cities in the region, or of a similar size, are charging for such a task.

Developers Fees (to the extent permitted under Virginia Code). In lieu of or in addition to new tree-related plan and inspection fees, and previously mentioned currently required expenses for tree preservation compliance, landscape installation, and other zoning/subdivision regulation activities, developers could be required to pay a set amount to support Leesburg's overall urban forestry program. In effect, it would be a cost of doing business within the Town limits. The fee could be a percentage of the total project cost, based on the number of housing units built, or based on the area of land being developed. The Town's Planning Department may have better information upon which to base this fee. It is suggested that this fee would be paid and deposited in the Tree Bank before the project is approved.

Utility Company Fees (to the extent permitted under Virginia Code). Non-municipal utility companies perform new construction, maintenance, and repair work on an annual basis in the Town. This work may affect the aboveground and belowground portions of public trees. It is prudent and reasonable to assess a fee to such utility companies when their work affects municipal trees. Utility companies with aerial facilities might be required to provide the Town an anticipated annual work plan and maps with an appropriate fee attached to provide for inspection and monitoring. Any compensation for documented damage to public trees during utility work would be collected separately on a case-by-case basis, and the utility company should be responsible for the costs for any remediation necessary (*e.g.*, pruning, fertilization, or temporary irrigation) above and beyond the fees and compensatory payment. The same conditions would apply for companies installing or maintaining underground utilities.

Private Donations/Corporate Sponsorships. Leesburg is fortunate to have generous citizens who care about the quality of life in the Town. The Parks Department, for example, has received sizable private donations to improve park facilities. The Tree Commission could also solicit citizens for private donations to support tree planting, tree care, and public education activities. A major source of donations could be from businesses and corporations who wish to sponsor non-profit, environmental activities. All potential contributors should be reminded that any donations might be tax-deductible when they file their federal income tax return if their financial situation allows.

Utility Bill Donations. The Town bills property owners directly for water and sewer services. These municipal invoices could be a source for needed funds for the urban forestry program. A small fixed amount from $0.25 to $1.00 could be automatically added to each bill; the property owner would then have the option to voluntarily include it with their utility payment. Another option is to ask the bill payers to round the invoice amount up to a higher figure of their choice.

Using this voluntary funding mechanism can potentially raise thousands of dollars. It will require the cooperation of the Utility Department, and coordination with Finance Department to implement this program.

Fund-Raising Activities. With the support of volunteers, the Town can hold various fund-raising events throughout the year. Popular large events include competitive and social runs and walks. Volunteers can staff food and drink booths at local fairs and festivals. Tree and Leesburg-related merchandise could be commissioned and sold. Restaurants can have special Tree Nights where a small percentage of the patrons' bills is donated back to the Town for tree planting. Even small efforts, such as school and church bake sales and yard sales, can be encouraged to raise funds for trees in the community.

Firewood/Mulch/Wood Sales. If Town property can be sold, the wood waste from tree maintenance and storm damage repairs can be a source of funds for the Tree Bank. Other cities have been successful in selling split and un-split firewood, hardwood timber, and rough wood chips to the general public and commercial businesses. Rather than pay for proper removal and disposal, cities sell these excess wood products. A new trend is when a significant or historic public tree must be removed, the logs and useable wood are given to local craftsmen who then create furniture, sculpture, and other collectibles from the wood. These are sold and all or portions of the proceeds are returned to the Town.

7.2 Other Funding Tools

The following sources of revenue are not appropriate for inclusion in Leesburg's Tree Bank, but are each viable sources of funding for the comprehensive urban forestry program.

Increase the General Fund Allocation to the Urban Forestry Program (to the extent permitted under Virginia Code). During future budgeting cycles, the Town should consider increasing the financial resources available for urban forestry staff and functions and making a separate budget line-item for the urban forestry program.

Restructure the Subdivision and Landscape Regulations, Section 13-45 Fees (to the extent permitted under Virginia Code). The Town could restructure the Section to include charges for inspection of tree preservation areas and new tree plantings. These fees could be used to support a part-time or full-time public employee or a contractual consulting Certified Arborist to ensure that the review process is conducted fairly and professionally, and freeing the Urban Forester position from these duties to accomplish other urban forest management goals and tasks.

Create Tax Increment Districts for special tree planting and maintenance needs. Support the recommendation in the Leesburg Business Development Strategy Plan to create Tax Increment Districts (TID) in Leesburg. As discussed previously, since this funding mechanism is allowed by Virginia Code, portions of the TID monies could be budgeted for urban forestry activities in those areas.

Create a Urban Forest Public Utility (to the extent permitted under Virginia Code). The urban forest is a valuable economic asset, providing key services, such as cooling, clean air, flood control, and carbon sequestration. The management of this resource and continued investment to improve it will result in an increase in the urban forest and improve its capacity to provide additional benefits. The Town could create a utility to manage the urban forest and collect a fee from residents for the services the utility provides.

Obtain Grants. As a municipality and a non-profit with existing support structures and staff, Leesburg is in a good position to apply for and receive grants to support urban forestry activities. The Town has previously received grants for urban forestry projects, but with the investment in time and a person skilled in grant writing, there are likely multitudes of grant opportunities for Leesburg. These opportunities can be found with the State and Federal governments, non-profit organizations, large corporate and private business foundations, and private charitable foundations. If Leesburg establishes a Tree Bank, there will be a ready source of matching funds to leverage even more grant dollars.

Promote the Federal Tax Incentive to Citizens. As a non-profit, the Town is in a unique position to encourage citizens to directly pay for desired tree planting and tree maintenance on public property. The Town should inform property owners abutting the public rights-of-way, parks, or other Town properties that if they pay for Town-approved, proper public tree planting or tree maintenance, then that effort and any related expenditures may qualify as a charitable deduction on their federal income tax return. Until the Town's urban forestry program is fully staffed, equipped, and funded, this mechanism is a good public relations tool as well as a way to accomplish needed work.

8.0 Management Goals

The overarching goals of Leesburg's *Urban Forestry Management Plan* is to guide the Town's efforts to recover the loss of tree canopy and enhance all tree-related benefits by recommending strategies and actions to improve the Town's urban forest management in an equitable, economic, and sustainable manner. The *Urban Forestry Management Plan* seeks to be an integral part of the *2005 Town Plan*, and will achieve its goals by recommending strategies, goals, policies, standards and actions to protect, enhance, expand, and preserve the tree canopy for the benefit of the community.

Through public participation, input from Town staff, and a detailed analysis of urban forestry conditions, five management goal areas emerged as priorities for Leesburg:

1. Tree Planting and Increased Forest Canopy Cover
2. Improved Tree Planting/Protection Legislation and Policies
3. Expanded Education and Public Relations
4. Improved Organizational Structure and Funding
5. Improved Urban Forest Maintenance

8.1 Major Goal Areas, Statements, and Objectives

Achieving progress and success in the five major goal areas should be the Town's priority in the next ten years. These major goals are summarized below. Specific action steps are found in Table 17, *Goals, Objectives, and Recommendations*, at the end of this chapter.

Goal Area—Tree Planting and Increased Forest Canopy Cover

Statement: Leesburg's canopy cover has been estimated at only 8%, and it is rapidly disappearing due to forest removal on private property and lack of new and replacement tree planting on public and private properties. Without an adequate forest canopy cover, Leesburg will not realize the many tangible and intangible benefits trees provide, and the character of the Town will suffer.

Objectives:

1. Achieve an overall tree canopy cover of 40%.
2. Create a *Master Tree Planting Plan* with prioritized areas, including, but not limited to, these public areas: streets, parks, pathways/trails, public buildings, and gateways.
3. Revise current legislation, enact new legislation, and/or create incentives for private property owners to plant trees on private properties, including, but not limited to, these areas: residential yards, commercial lots, parking lots, and grounds, and near ponds, rivers, and streams.
4. Ensure that all new tree planting is monitored to ensure species diversity and is performed using current arboricultural standards.
5. Seek to establish an adequate level of funding for tree planting through increased allocations from the general fund, grants, donations, fees, and other sources, to the extent permitted under Virginia Code.
6. Plant trees only if there is a maintenance program and adequate resources available to care for the trees.

Goal Area—Improved Tree Planting/Protection Legislation and Policies

Statement: The Town should review and improve ordinances, guidelines, and policies regarding tree planting and tree and forest protection, and create or enact new legislation and policies as needed. These policies will serve as an official statement by the Town regarding the importance and value of trees in the community.

Objectives:

1. Review and revise the Zoning Ordinance to reconcile canopy cover requirements with current standards, to improve and facilitate enforcement of the tree-related development requirements, increase penalties for non-compliance, and ensure the ordinance refers to and uses the current arboricultural and horticultural standards.
2. Review and revise the Subdivision and Land Development Regulations to require a higher degree of accountability for developers to preserve existing forests and plant new trees. Consider changing the fee structure to support more professional arboricultural review, inspection, and coordination (to the extent permitted under Virginia Code). Emphasize the need for developers to replace trees (no net loss policy).
3. Review and revise the DCSM, Article 8, *Vegetation, Preservation and Planting*, to ensure all current arboricultural and horticultural standards and practices are referenced and used.
4. Create a new and separate Article in the Town Code for a Public Tree Ordinance that clearly states the Town's responsibility for all public trees, describes the Tree Commission and their duties for determining urban forest management policies, designates the Urban Forester as the primary public staff position responsible for management decisions, allows for collection of compensatory payments for public tree damage or removal, and allows the creation and enforcement of a Public Tree Work Permit application and program.

Goal Area—Expanded Education and Public Relations

Statement: Citizens, businesses, Town staff and leaders, and developers need continued education and marketing targeted to increase their awareness of the benefits of trees. They need to be aware of the availability of Town resources and the various ways they can become more involved in the urban forest management program and be a part of the solution.

Objectives:

1. Continue public and citizen urban forestry outreach efforts through a wide variety of media outlets, special events, and publications to instill a sense of civic pride and gain more financial and political support for the urban forestry program.
2. Create a standardized educational program for orienting newly elected public officials to the Town's urban forestry program, efforts, and goals.
3. Promote internal educational opportunities by increasing professional interaction, coordination, and communication between departments and staff regarding tree planting and maintenance principles and practices.

4. Market the urban forestry program and its successes outside of the Town to the County, Commonwealth, region, and the country. A widespread and heightened awareness of the quality of the urban forest and of life in Leesburg promotes economic development, which, in turn, enhances the visibility and political stature of the program.

Goal Area—Improved Organizational Structure and Funding

Statement: Currently, the components of and resources for Leesburg's urban forest management program are decentralized in various departments. Critical to the program's success is adequate funding, a centralized focus and improved interdepartmental coordination and communication.

Objectives:

1. Centralize urban forest management responsibilities, staff, equipment, funding, and resources. Proactive and efficient management requires task/issue identification and prioritization, expert guidance, internal review, external approval, and execution of the decision. Centralization facilitates this set of requirements.
2. Encourage frequent, regular, and formalized interdepartmental coordination regarding urban forestry related projects and issues through the use of pre-construction meetings for public and private projects, staff meetings, interdepartmental project review mechanisms, and permit review and approval.
3. Seek new and reallocated funding sources to support a comprehensive urban forestry program. A national average sets the minimum annual budget at $5 per capita, which equals approximately $175,000 for Leesburg.

Goal Area—Improved Urban Forest Maintenance

Statement: Proper and timely tree maintenance is required to maximize tree benefits, increase service life, improve aesthetics, and ensure public safety. Maintenance programs are critical to the survival, vitality, and growth of existing trees and of newly planted trees.

Objectives:

1. Implement four tree maintenance programs—preventive maintenance on a 10-year cycle, routine maintenance on an as-needed or request basis, young or small tree maintenance, and an emergency response program.
2. Conduct a complete public tree inventory every ten years, and use a tree management software program to update the data, document maintenance work and costs, and create annual work plans.
3. Mandate the use of current and accepted best management practices and arboricultural work standards in all maintenance activities.
4. Adequately train Town employees performing maintenance, encourage Town staff to become Certified Arborists, and hire contractors who perform work to the highest industry standards.

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8.2 Goals, Objectives, and Recommendations

Table 17. Goals, Objectives, and Recommendations

Goals	Objective	Recommendations	Chapter Reference	Priority	Timeframe
1. Tree Planting and Increased Forest Canopy Cover	1A. Achieve an overall tree canopy cover of 40% in the Town of Leesburg.	1A.i. Set minimum percent canopy cover per land use.	3.2.1	High	Short-term
		1A.ii. Achieve at least a 90% stocking level for street trees.	5.6	High	Optimum—2015
					Moderate—2020
					Minimum—2025
		1A.iii. Perform periodic canopy analyses.	6.7.6	Low	Mid-term
		1A.iv. Create a tree mitigation site(s) on public or protected properties.	6.7.8	High	Mid-term
	1B. Create a Town *Master Tree Planting Plan* with prioritized areas.	1B.i. Create a plan with optimum number of trees per area or land use.	6.4.9	High	Mid-term
		1B.ii. Review and update the master recommended tree list.	3.2.1, 3.2.4	Low	Bi-annually, short-term
	1C. Revise current legislation, enact new legislation, and/or create incentives for tree planting on private property.	1C.i. Consider strengthening Town ordinances to require greater tree planting and long-term accountability on private property.	3.2.1	High	On-going, short-term
		1C.ii. Consider density bonuses, tax abatements, and other incentives to plant and maintain tree cover on private property.	3.2.1	Medium	On-going, short-term
	1D. Ensure a high level of overall species diversity.	1D.i. Achieve a species mix where no single genus or species comprises more than 20% and 10%, respectively, of the total tree population.	6.4.2	High	On-going, short-term
		1D.ii. Favor large canopy tree species.	3.2.1, 6.7.7	High	On-going, short-term
		1D.iii. Plant urban-tolerant species.	6.4.3	High	On-going, short-term
	1E. Perform tree planting using current arboricultural and horticultural standards.	1E.i. Planting operations should revised to incorporate ANSI standards.	3.2.1, 3.2.4	High	Short-term
		1E.ii. Achieve an urban forest that has a 20:60:20 mix of small, medium, and large mature trees.	5.3	Medium	Long-term
	1F. Establish adequate funding for tree planting.	1F.i. Establish a minimum level of service for tree planting of $95,000 annually.	6.4.4	High	Annually adjusted, mid-term
	1G. Plant public trees only if there is a maintenance program.	1G.i. Establish a small tree maintenance program.	5.5, 6.3	High	On-going, short-term
2. Improved Tree Planting/ Protection Legislation and Policies (continued on next page)	2A. Review and revise the Zoning Ordinance.	2A.i. Revise Article 12.2 to include the Urban Forester as the primary, or one of the primary, Town review and enforcement officials.	3.2.1	Medium	Short-term
		2A.ii. Reconcile the 20-year tree canopy requirements in Section 12.3 with the Tree Commission goals and current urban forest management standards	3.2.1	Medium	Short-term
		2A.iii. Research and implement the long-term inspection and enforcement of the tree canopy requirements.	3.2.1	High	Short-term
		2A.iv. Revise and replace the schematics and specifications for planting trees in the right-of-way in Section 12.4.5.A and B with currently approved methods for planting trees in streetscape and roadside situations.	3.2.1	Medium	Short-term
		2A.v. Amend Section 12.9 to reference specific current, nationally accepted professional arboricultural and horticultural standards.	3.2.1	High	Short-term
		2A.vi. Create a special purpose district for the tree canopy in Leesburg.	3.2.1	Medium	Short-term
	2B. Review and revise the Subdivision and Land Development Regulations.	2B.i. Restructure Section 13.45 to include charges for inspection of tree preservation areas and new tree plantings.	3.2.3	Medium	Short-term
		2B.ii. Designate the Urban Forester as a reviewer throughout the entire subdivision approval process.	3.2.3	High	Short-term
		2B.iii. Review and amend Section 13.86 to address tree loss during development and require a no net tree loss policy for private property development.	3.2.3	High	Short-term
		2B.iv. Add the *Urban Forestry Management Plan* to the 11 required specifications of Section 13.99.	3.2.3	High	Short-term
	2C. Review and revise Article 8 of the Design and Construction Standards Manual.	2C.i. State that all fieldwork shall be done in accordance to ANSI horticultural and arboricultural standards.	3.2.4	High	Short-term
		2C.ii. Improve Section 8-310 by referencing ANSI A300 Part 5 standards, and review the replacement policy for retained trees that are damaged.	3.2.4	High	Short-term
		2C.iii. Improve Section 8-400 with ANSI standard references, and designate the Urban Forester as an approval source.	3.2.4	High	Short-term
		2C.iv. Section 8-500 Tree and Plant Selection should refer to the updated lists and guidelines in the Zoning Ordinance.	3.2.4	Medium	Short-term
		2C.v. Improve Section 8-600 with ANSI Standards as well as other national, state, and local standards.	3.2.4	High	Short-term
	2D. Create a Public Tree Ordinance.	2D.i. Urban Forester, Town Attorney, and Town Manager creates the ordinance and Council adopts it.	3.2.2, 3.2.5, 4.3	High	Short-term
		2D.ii. Implement a public tree work permit system.	3.2.2	High	Short-term
	2E. Increase and improve tree preservation efforts.	2E.i. Increase inspection and enforcement of Town regulations on private property.	3.2.1	High	Mid-term
		2E.ii. Use most currently accepted BMPs for preserving trees on construction sites and develop Tree Preservation Plans for construction projects.	6.7.11	High	On-going, short-term
		2E.iii. Encourage land donations and conservation easements to protect remaining forest tracts.	6.7.5	Medium	On-going, short-term

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Table 17. Goals, Objectives, and Recommendations (Continued)

Goals	Objective	Recommendations	Chapter Reference	Priority	Timeframe
2. Improved Tree Planting/ Protection Legislation and Policies (continued from previous page	2F. *2005 Town Plan.*	2F.i. Document Leesburg's *Urban Forestry Management Plan* in the *2005 Town Plan.*	3.1.1	High	Short-term
		2F.ii. Assist the Town with implementation of the Action Program in the *2005 Town Plan.*	3.1.1	High	On-going, short-term
		2F.iii. As existing tasks in the Action Program are accomplished, develop additional tasks to implement and meet the goals of the *2005 Town Plan.*	3.1.1	Medium	On-going, short-term
	2G. *Business Development Strategy Plan*.	2G.i. Support the business community's effort to create Tax Increment Districts in Leesburg that will support and enhance urban forest services.	3.1.2	High	On-going, short-term
		2G.ii. Support the business community's efforts to create a grant program for tree and landscape planting on private property.	3.1.2	High	On-going, short-term
		2G.iii. Support the Economic Development Commission's goal to create a 501(c) (3) nonprofit development organization to hold land and take donations.	3.1.2	Medium	Coordinated with EDC schedule
	2H. *Residential Traffic Management Plan.*	2H.i. Implement the recommendations to incorporate trees and landscaping in each improvement project as appropriate.	3.1.5	High	On-going as projects begin, short-term
		2H.ii. Promote the Adopt-A-Street program.	3.1.5	High	On-going, short-term
		2H.iii. Develop standards, specifications, and/or policies for appropriate sight distance requirements for tree planting in the right-of-way.	3.1.5	High	On-going, short-term
	2I. *Comprehensive 20-Year Parks, Recreation, Open Space, Trails, and Greenways Master Tree Planting Plan.*	2I.i. Coordinate tree planting and fund raising goals.	3.1.4, 6.7.7, 8.0	High	On-going, short-term
		2I.ii. Increase communication between staff and Commissions.	3.1.4	Medium	On-going, short-term
	2J. *Tree Commission Strategic Plan.*	2J.i. The Commission members' duties and responsibilities should be formalized by including such descriptions in an ordinance of the Town Code.	3.1.3, 3.2.2	Medium	Reviewed every 3 years, short-term
		2J.ii. Commission should prioritize their efforts to focus on seeking additional funding and support from the Council, and educating and organizing citizens to support urban forest management.	3.1.3	High	On-going, short-term
		2J.iii. Review the Strategic Plan and annually report accomplishments and amendments to the Town Council and the citizens.	3.1.3	High	Annually, short-term
	2K. *Urban Forestry Management Plan.*	2K.i. Review Plan and program accomplishments annually and report findings to Town Council and citizens.	3.1.3	High	Annually, short-term
		2K.ii. Consider major updating and revisions.	3.1.3	Low	Every 10 years, long-term
	2L. *Tree Removal and Replacement Guidelines*.	2L.i. Review and update guidelines considering current industry standards and local empirical success/failure.	3.3	High	Annually, short-term
	2M. *Tree Planting Specifications*.	2M.i. Review and update specifications considering current industry standards and local empirical success/failure.	3.3	High	Annually, short-term
	2N. *Tree Protection Specifications*.	2N.i. Review and update specifications considering current industry standards and local empirical success/failure.	3.3	High	Annually, short-term
3. Expanded Education and Public Relations	3A. Continue public and citizen urban forestry outreach efforts.	3A.i. Arrange or participate in local events to promote trees and the urban forestry program.	6.7.10	High	Annually, short-term
		3A.ii. Encourage individual citizen interactions with the Urban Forester and Tree Commission members.	6.7.10	Medium	Annually, short-term
		3A.iii. Establish a printed or electronic urban forestry newsletter.	6.7.10	Low	Annually, short-term
	3B. Create an educational program for elected public officials.	3B.i. The Tree Commission and Urban Forester should inform and educate elected Town leaders.	6.7.10	High	Annually, short-term
	3C. Promote internal educational opportunities.	3C.i. The Urban Forester should regularly host tree benefits and planting and maintenance education sessions with Town staff.	6.7.10	High	Annually, short-term
		3C.ii. Daily, routine interaction of the Urban Forester and other Town staff should be viewed as educational opportunities.	6.7.10	Medium	Annually, short-term
	3D. Market the urban forestry program.	3D.i. Seek regional and national conference presentations and publication of articles.	6.7.10	Low	Annually, short-term
		3D.ii. Urban Forester should work with the business and tourism communities to include the benefits of trees into their outreach efforts and projects.	3.1.2, 6.7.10	Low	Annually, short-term
4. Improved Organizational Structure and Funding	4A. Centralize urban forest management.	4A.i. Reorganize major urban forestry tasks and duties into one department.	4.3	High	Mid-term
		4A.ii. Urban Forester should be designated as the key decision-maker in all tree-related matters.	4.3	High	Short-term
	4B. Increase staff and resources.	4B.i. Perform a job analysis to determine optimum staffing levels.	4.3	Medium	Short-term
		4B.ii. Perform an operational review to determine workloads, equipment needs, and training needs.	4.3	Medium	Short-term
	4C. Encourage interdepartmental coordination.	4C.i. The Urban Forester becomes more involved in public project planning and review.	4.3	High	On-going, short-term
		4C.ii. The Town Manager provides leadership to ensure efficient communication, coordination, and cooperation.	4.3	High	On-going, short-term
	4D. Seek new and reallocated public and private funding sources.	4D.i. Perform a budget analysis on current Town operational and capital budgets related to urban forest management.	4.3	Medium	Short-term
		4D.ii. Create a Tree Bank to collect, manage, and disperse monies from various sources.	7.1	High	Short-term
		4D.iii. Increase and/or reallocate General Fund support of urban forestry program.	7.2	Medium	Short-term
		4D.iv. Seek corporate and private grants.	7.2	High	On-going, short-term
		4D.v. Use tax incentives to increase citizen and business participation in the urban forestry program.	7.2	High	On-going, short-term
		4D.vi. Authorize the collection of compensatory payments for public tree damage.	3.2.2	Medium	Short-Term

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Table 17. Goals, Objectives, and Recommendations (Continued)

Goals	Objective	Recommendations	Chapter Reference	Priority	Timeframe
5. Improved Urban Forest Maintenance	5A. Implement various tree maintenance programs for all public trees.	5A.i. Establish a preventive maintenance program.	5.5	Medium	100% rotation every 10 years, short-term
		5A.ii. Implement an insect and disease monitoring program.	6.6.1	High	Annually, or as needed, short-term
		5A.iii. Establish a routine, mature tree care program.	5.5.4, 6.2	Medium	As needed or requested, short-term
		5A.iv. Establish a new or small tree maintenance program	5.5, 6.3	High	100% rotation every 3 years, short-term
		5A.v. Establish an emergency response and risk tree management program.	5.5.3, 6.6.2	High	Short-term
		5A.vi. Create and properly equip a Town tree maintenance crew(s), or contract for the service.	6.0	Medium	On-going, short-term
	5B. Conduct a complete public tree inventory.	5B.i. Perform a complete public tree inventory.	5.7	Medium	10-year intervals, long-term
		5B.ii. Commit to regular, routine inventory data entry and updating.	5.7	High	On-going, short-term
		5B.iii. Use GPS and GIS technologies to help manage the urban forest.	5.8	Low	At time of next inventory, mid-term
	5C. Use current and accepted best management practices and arboricultural work standards.	5C.i. Use all appropriate and current versions of the ANSI standards in tree maintenance operations.	6.0	High	On-going, short-term
	5D. Train Town employees.	5D.i. Use all best management practices promoted by arboricultural industry leaders.	6.0	High	On-going, short-term
		5D.ii. Review Urban Forester's tree planting, protection, and removal and replacement specifications annually and revise as needed.	3.3	Medium	On-going, short-term
		5D.iii. Encourage key staff to become Certified Arborists and/or Certified Tree Workers.	6.3.6	Medium	On-going, short-term
		5D.iv. Provide frequent in-house and professional training for all tree planting and maintenance tasks, safety, and equipment and tool use.	6.3.6, 6.6.2, 6.7.10	High	On-going, short-term

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8.3 Summary of Staffing and Funding Recommendations for Plan Implementation

The *Urban Forest Management Plan* has presented goals, objectives, and action items for short- and long-term implementation. Many actions simply require additional or new analysis and decision-making by Town staff, Town leaders, and volunteers. Other actions can be implemented by revising standards and specifications, and by amending ordinances and regulations. These implementation tasks do not necessarily nor directly require more staff or funding.

However, there are particular action items that do suggest or require additional funding and staffing levels, and further contractual and consultation services. The Town will need to make decisions, set priorities, and take action based on the potential costs of these items and goals.

The following is a discussion and summary of the primary tasks and/or action items recommended in the Plan to achieve the major goals of increasing tree canopy cover and improving the comprehensive urban forestry program in Leesburg.

8.3.1 General Program Funding and Staffing Levels

Based on recent research by the Society of Municipal Arborists (McGannon, Jim, "Urban Forestry Programs Across America," *City Trees*, July/August, 2001), there is a standard budget and staffing level to support a comprehensive urban forestry program that performs tree planting, maintenance, emergency services, public relations, and supervision. The standard is $5.00 per capita.

Leesburg's current population is near 35,000, and it is projected to be 45,000 in less than 5 years. Given these population figures and using the national standard, Leesburg's general funding level should be between $175,000 and $225,000 annually. For discussion purposes, a budget of $225,000 will be used.

As for staffing levels, in general, two full-time positions—Town Urban Forester and Assistant Town Urban Forester or Urban Forestry Technician—would be advisable to have to accomplish the administrative, fieldwork, and public service duties of Leesburg's program.

Since tree planting will be a high priority for Leesburg, the Town should focus on increasing staff for small tree maintenance activities. It has been Davey Resource Group's experience that, based on the generally small size of the trees in this category, a crew of two properly trained personnel would be capable of accomplishing the work. These two people and their equipment can be new hires, redirected existing staff, or trained volunteers under the direction of the Town Urban Forester. After the operational review is complete more information will be available to the Town to determine the best option to staff the Town's small tree maintenance crew.

Given the current urban forest conditions and the major goal of increasing canopy cover, and using the national standard for budgeting, the Leesburg urban forestry program's budget would be recommended to be allocated as presented in Table 18.

Table 18. Urban Forestry Funding Distribution

Program Activity	Percentage of Budget	Dollar Amount
Tree planting	42	$95,000
New tree maintenance	18	$40,000
Removals	4	$10,000
Pruning	9	$20,000
Emergency work	4	$10,000
Administration	23	$50,000

Based on this standard, national average budget level, the allocations for each program activity reflect Leesburg's primary goals:

- 60% of available funds supports a new tree planting and maintenance program that will begin increasing the canopy cover.
- 23% of the budget supports staff to manage the projects, provide customer service, and promote the urban forestry program.
- 17% of the budget is suggested for routine and emergency maintenance tasks.

8.3.2 Task-Based Street Tree Program Funding Levels

Using and extrapolating from the existing inventory data, and based on site observations and other information, the Plan suggested various levels of funding for right-of-way tree planting and maintenance tasks for Leesburg. The levels of funding for Leesburg's public trees are summarized in Table 19.

Table 19. Levels of Funding for Right-of-Way Tree Planting and Maintenance Tasks

Annual Priority Tree Maintenance Levels of Service		
High	**Medium**	**Low**
$10,835	$5,417	$3,611
72 trees	365 trees annually	24 trees annually
Accomplish hazard tree removals and prunes in 1 year	Accomplish hazard tree removals and prunes in 2 years	Accomplish hazard tree removals and prunes in 3 years
Annual Tree Maintenance Levels of Service		
$8,345	$5,840	$4,525
170 trees annually	121 trees annually	95 trees annually
5-year pruning cycle	7-year pruning cycle	9-year pruning cycle
Annual Training Tree Maintenance Levels of Service		
$13,380	$10,125	$6,870
892 trees	675 trees	458 trees
Training pruning on a 3-year cycle	Training pruning on a 3-year cycle	Training pruning on a 3-year cycle
Annual Tree Planting Levels of Service		
$190,960	$143,220	$95,480
868 trees	651 trees	434 trees
Annual planting to reach full stocking in 10 years	Annual planting to reach full stocking in 13 years	Annual planting to reach full stocking in 20 years
Total Annual Street Tree Planting & Maintenance Levels of Service		
$223,520	$164,605	$110,485

Other urban forest management tasks and activities needed to satisfy Leesburg's goals are not captured in the tables above. Additional recommendations and cost estimates made in the Plan are presented in Table 20.

Table 20. Additional Plan Recommendations and Costs

Task	Description	Cost
New Tree Maintenance	Fertilization, mulching, and watering newly planted trees on a three-year cycle. Estimated at $20/tree annually for each level of service (LOS) as shown in Table 13.	$8,680 (Low LOS) $13,020 (Medium LOS) $17,360 (High LOS)
Mature Tree Care	Fertilization, mulching, insect and disease treatment, and cabling and bracing. Estimated on an as-needed basis at $100/tree for 20 trees annually.	$2,000 annually
Other Public Property Tree Maintenance	Perform pruning and removal services for trees on parks and other public properties. Estimated from existing inventory data.	$11,000 annually
Other Public Property Tree Planting	Plant landscape trees and reforest vacant unused land areas on park and other public properties. Estimated at $220/tree for 200 trees annually, and $5,000 per reforestation project at two projects annually.	$54,000 annually
Townwide Public Tree Inventory	Perform an updated GIS-based tree inventory and mapping project for all right-of-way and public property trees.	$30,000 to $50,000 one-time
Management	Purchase software program for data tracking, work and budget reporting, customer service logs, and budget forecasting. Includes training and technical support.	$6,000 to $9,000 one-time
Town Forest Canopy Mapping	Perform an updated, interim forest canopy analysis/study. Optional forest benefits modeling could also be performed.	$10,000 to $20,000 one-time

8.3.3 Summary of Management Goals

Since Leesburg is effectively just beginning to consider organizing and funding a truly comprehensive urban forestry program, the budget and staffing requirements may seem daunting. The Town should consider each urban forest management task or component presented in the Plan and decide if and how best to implement the recommendation.

Many Plan recommendations can be implemented in phases over a period of a few years. Not all Plan recommendations need to be solely supported by the Town's General Fund. Innovative, public/private partnerships and other funding suggestions presented in the Plan, can be used to support overall or particular urban forestry functions and tasks.

If the Town of Leesburg wishes to achieve a 40% canopy cover in 20 years, then the highest priority should be implementing the planting recommendations. In addition, the new tree maintenance tasks are integral to the growth of these new trees and their ultimate contribution to the total canopy coverage. Therefore, at least $103,500 should be dedicated to the planting and maintenance program.

It is also vital that Leesburg protect and maintain the trees and forest cover it already has. Therefore, at least $28,000 should be available for mature tree care and maintenance.

Considering staffing costs and other program expenses, an initial annual budget of at least $225,000 is advisable to begin building the comprehensive urban forestry program and achieve the Town's major forest canopy goals.

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9.0 Conclusion

Historically, Leesburg has boasted about its fine park system, beautiful natural setting, and abundant natural resources found in the forested hillsides, fields, and waterways that characterize the Town. These natural resources contributed greatly to the charm, ambiance, and character for which Leesburg is widely known.

Recently, however, changing demographics, renewed interest and activity in attracting business and increasing residential development, and new research on the benefits urban forests provide cities all pointed to the need for an evaluation of the current urban forest resources and management in Leesburg and creating a plan of action. The *Urban Forest Management Plan* is the resulting action plan and is based on major goals that collectively lead to creating a sustainable urban forestry program.

9.1 Management Goal Areas and Key Recommendations

The overarching goal of Leesburg's *Urban Forestry Management Plan* is to guide the Town's efforts to recover the loss of tree canopy and enhance all tree-related benefits by recommending strategies and actions to improve the Town's urban forest management in an equitable, economic, and sustainable manner. The five *Management Goal Areas* are presented below with the key recommendations. A detailed list of the recommendations to achieve each goal is presented in Table 17 located in Chapter 8.2, *Goals, Objective, and Recommendations*.

1. **Tree Planting and Increased Forest Canopy Cover**

   Leesburg's canopy cover has been estimated at only 8%, and it is rapidly disappearing due to forest removal on private property and lack of new and replacement tree planting on public and private properties. Without an adequate forest canopy cover, Leesburg will not realize the many tangible and intangible benefits trees provide, and the character of the Town will suffer.

   Key Recommendations: Achieve an overall tree canopy cover of 40% by a combination of creating and implementing a Town *Master Tree Planting Plan*, revising current legislation, enacting new legislation, creating incentives for private property owners to plant trees on private properties, and ensuring there is adequate funding for tree planting and maintenance.

2. **Improved Tree Planting/Protection Legislation and Policies**

   The Town should review and improve ordinances, guidelines, and policies regarding tree planting and tree and forest protection, and create or enact new legislation and policies as needed. These policies will serve as an official statement by the Town regarding the importance and value of trees in the community.

   Key Recommendations: Improve Town legislation by reviewing and amending, as needed, the Zoning Ordinance, Subdivision and Land Development Regulations, and Design and Construction Standards, as well as creating and adopting a defensible Public Tree Ordinance; and incorporate urban forestry goals, programs and tasks with all other Town plans.

3. **Expanded Education and Public Relations**

   Citizens, businesses, Town staff and leaders, and developers need continued education and marketing targeted to increase their awareness of the benefits of trees. They need to be aware of the availability of Town resources and the various ways they can become more involved in the urban forest management program and be a part of the solution.

   Key Recommendations: Continue public and citizen urban forestry outreach efforts, and educate elected officials and Town employees on a regular basis.

4. **Improved Organizational Structure and Funding**

   Currently, the components of and resources for Leesburg's urban forest management program are decentralized in various departments. Critical to the program's success is adequate funding, a centralized focus and improved interdepartmental coordination and communication.

   Key Recommendations: Centralize urban forest management responsibilities, staff, equipment, funding, and resources, and seek new and reallocated funding sources to support a comprehensive urban forestry program at a minimum level of $175,000 annually.

5. **Improved Urban Forest Maintenance**

   Proper and timely tree maintenance is required to maximize tree benefits, increase service life, improve aesthetics, and ensure public safety. Maintenance programs are critical to the survival, vitality, and growth of existing trees and of newly planted trees.

   Key Recommendations: Implement and expand various tree maintenance programs, and conduct a complete public tree inventory every ten years using a tree data software program to manage the data.

9.2 Plan Implementation

It is hoped that Leesburg's *Urban Forestry Management Plan* will be a working document that can be used by the Town and the Tree Commission as a guide and reference source to achieve not only short- and long-term urban forestry goals, but Town goals as well.

With this Plan, Leesburg has an important and critical tool to help form, grow, and sustain an effective, progressive, and comprehensive urban forestry program. The Plan will allow the Tree Commission, Town staff and leaders, and the citizens to examine a number of urban forestry issues in terms of what is technically correct, organizationally feasible, and aesthetically complementary, as well as what is economically expedient.

"People in cities need to have living things around them. The most common biblical metaphor for the spirit is the wind; and trees show us the wind. The state of a city's trees is what tells us if the special spirit of a city is alive and blowing."

Sara Ebenrect, "Measuring the Value of Trees," American Forests, July/August 1988

The importance of comprehensive urban forestry management in Leesburg transcends the daily, operational maintenance routines and responsibilities; it stands to demonstrate the Town's leadership and commitment to improving the environmental quality of life for its citizens. It demonstrates that owning and managing land not only grants privileges but also entails obligations.

Leesburg's urban forest is a municipal amenity that will appreciate over time because trees are alive and growing. They provide tangible and intangible benefits to the Town and its citizens. Because of their significance to the environmental, social, and economic well-being of the Town, the urban forest should be professionally managed and protected to preserve them for all citizens and the future.